7 LAND, SOILS AND GEOLOGY

7.1 INTRODUCTION

This chapter of the EIAR assesses the effects of the proposed project on the land, soil and geological environment. Details of the existing environment at the proposed wind farm site, the proposed Turbine Delivery Route (TDR) accommodation areas and the Grid Connection Route (GCR) work areas are presented. The likely significant effects are assessed, and mitigation measures are proposed where required. Residual and cumulative effects are also assessed.

A full description of the proposed project is detailed in Chapter 2 - Description of the Proposed Project.

7.1.1 STATEMENT OF AUTHORITY

John Dillon and Peter McSherry of TOBIN have completed this chapter.

John Dillon (BSc, MSc, MCIWM, PGeo), is an environmental and hydrogeological specialist with over 18 years of experience in geological and hydrogeological assessment for Environmental Impact Assessment (EIA)s. He has contributed to a wide range of project EIA Reports across sectors such as infrastructure, extractive industries, renewable energy, and land development.

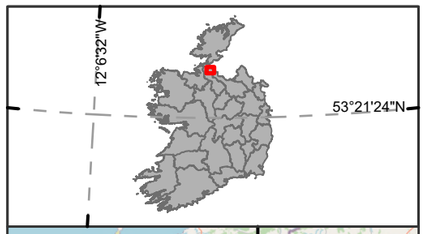
Peter McSherry (BSc., PGDip) is a hydrogeologist with over 5 years of geotechnical and hydrogeological experience in groundwater resources, contaminated land, ground investigation and various infrastructure developments. Peter was involved in the site supervision of site investigation and the completion of the EIAR chapter.

Geotechnical input has been provided by Ciaran Reilly of Ciaran Reilly and Associates. Ciaran Reilly 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.

Site investigations were co-ordinated and reviewed by Gabriella Horan from Causeway Geotech, Tony Lombard of APEX geophysics and Diarmaid MacLoughlin of Ground Investigations Ireland (GII). Further details related to relevant inputs of the various contributors and competent experts of the Project Team are provided in Table 1-4 of Chapter 1, Introduction.

7.1.2 Study Area

The study area for the Land, Soils and Geology assessment is outlined in Figure 7-1 and has been defined on the basis of a 2 km radius from the proposed wind farm site, in accordance with 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 proposed GCR and TDR accommodations uses a 200m buffer, based on the limited works, excavations and best practice, based on professional judgement; additionally, the southern site entrance for the TDR is assessed as part of the site study area.



Legend

- Application Boundary
- Study Area

0 1 2
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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

Rev	Date	Description	By	Chkd.
A	18/02/2026	First issue	S.P	S.R

Client:

FuturEnergy Ireland

Project:

Lissinagroagh Wind Farm

Title:

Figure 7-1
Proposed Wind Farm Study Area

Scale @ A3: 1:50,000

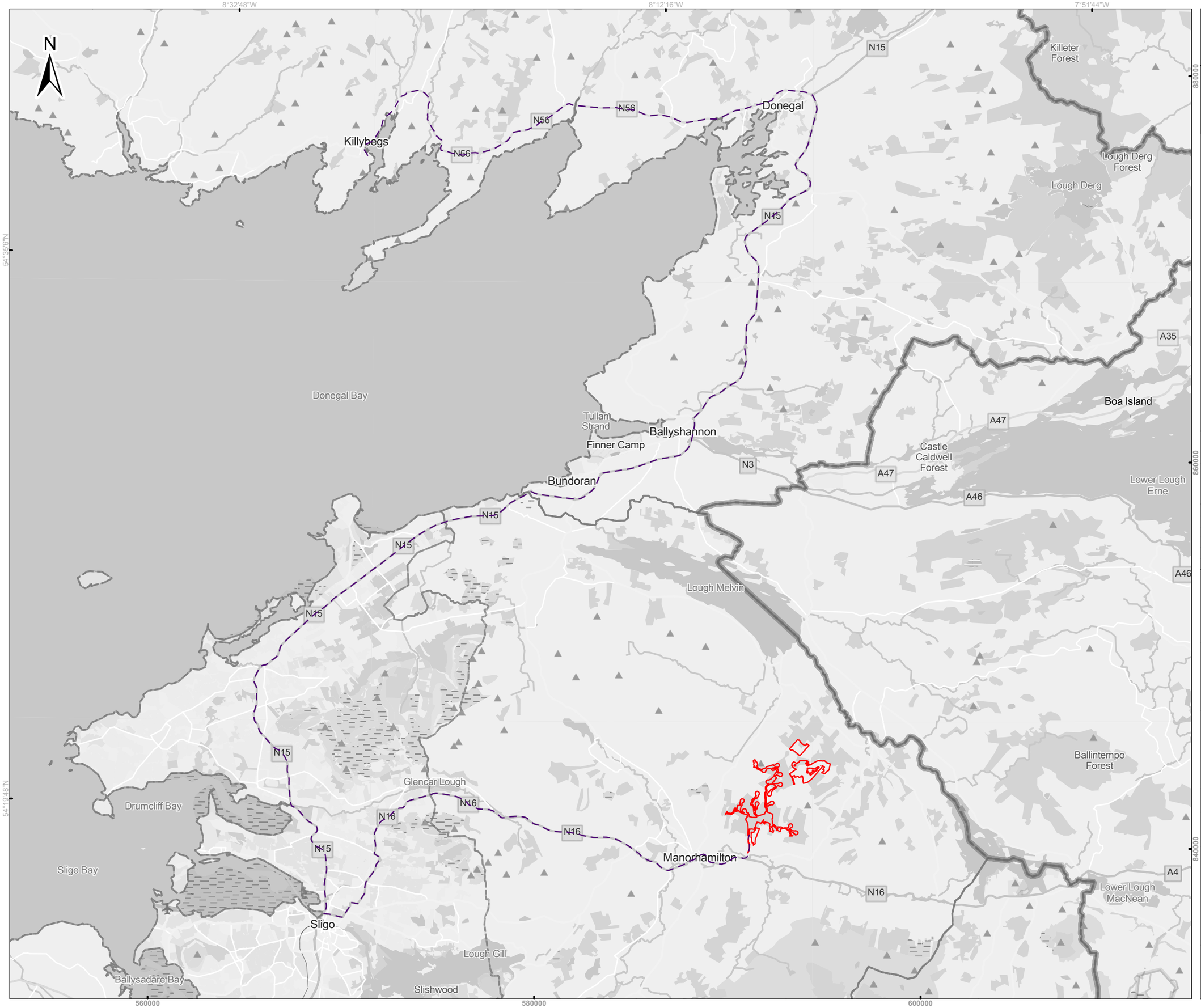
Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	February 2026

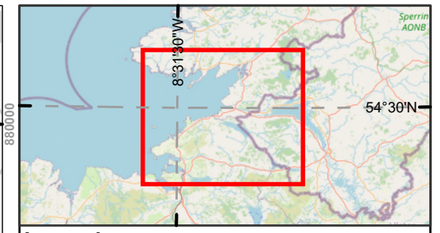
TOBIN

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

Map Ref: 10955-009-AE-P.App.BO-TOB-A

Draft: A





Legend

- Application Boundary
- Turbine Delivery Route

0 5 10
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

Rev	Date	Description	By	Chkd.
A	18/02/2026	First issue	S.P	S.R

Client:
Ireland FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-2:
Proposed TDR

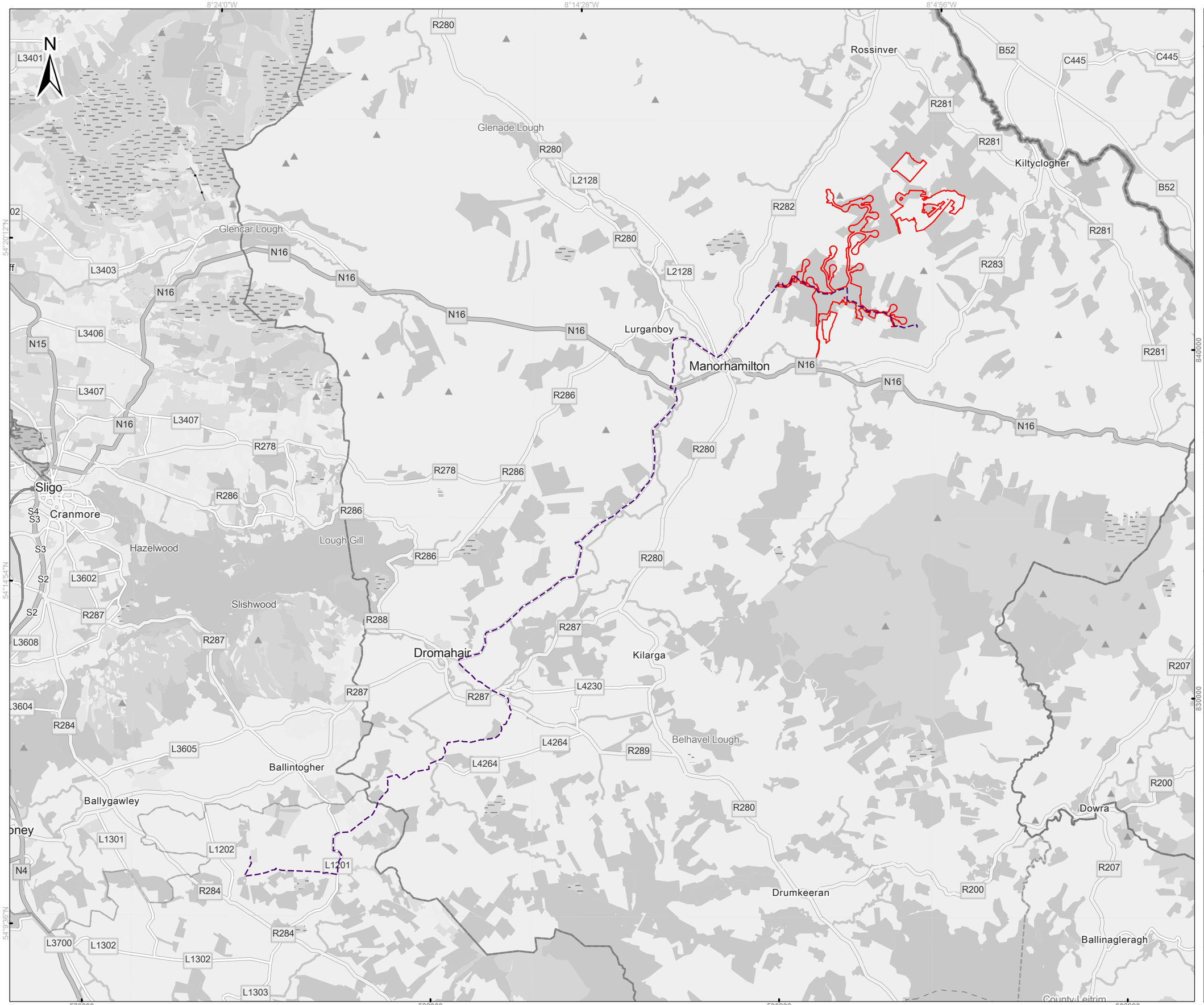
Scale @ A3: 1:180,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	February 2026

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

Map Ref: 10955-055-TDR-P.App.BO-TOB-A

Draft: A



Legend

- Application Boundary
- Grid Connection Route

0 2 4
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

Rev	Date	Description	By	Chkd.
A	18/02/2026	First issue	S.P	S.R

Client:
Ireland FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-3:
Proposed GCR

Scale @ A3: 1:100,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	February 2026

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

Map Ref:
10955-056-GCR-P.App.BO-TOB-A

Draft:
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7.1.3 Relevant Legislation and Guidance

This chapter has been prepared in accordance with the requirements of the following legislation:

- Planning and Development Act 2000, as amended
- Planning and Development Regulations 2001, as amended;
- Waste Management Act 1996, as amended;
- 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 (EIA Directive).

The following guidance documents have been adhered to:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022);
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2008a);
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2008b);
- Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (IGI, 2013); and
- Department of the Environment, Heritage and Local Government (DoEHLG), Wind Energy Development Guidelines (2006).

The above listed published documents were adhered to when preparing this chapter.

The significance of effects of the proposed project on the land, soils and geological environment has been assessed in accordance with the EPA (2022). The nomenclature set out in EPA (2022) was used to assign magnitude of significance.

7.1.4 Scoping and Consultation

As part of the EIA scoping process, an EIA Scoping Report (Appendix 1-1) was issued to relevant statutory and non-statutory bodies in December 2024 for review and comment. Full details, including a summary of responses received, are provided in Section 1.8.2 of Chapter 1 - Introduction. Consultation responses specific to Land, Soils and Geology are outlined in Table 7-1 with full responses included in Appendix 1-2.

Table 7-1: Summary of Consultation Responses

Consultee	Comments and Recommendations	EIAR Chapter/Section
Geological Survey of Ireland (GSI)	Encourages the use of GSI datasets. Confirmation that there is one County Geological Sites (CGSs) near the proposed project (Dough Mountain, Co. Leitrim (GR 593945, 842361). Also provided information on groundwater, geological mapping, geotechnical database resources, geohazards, natural resources, geochemistry (of soils, surface waters and sediments). Also requested that a copy of any reports detailing site investigations be sent to them to add to their data.	• Ch14 Cultural Heritage • Ch7 Land, Soils and Geology • Ch8 Hydrology and Hydrogeology
Inland Fisheries Ireland (IFI)	No response received from Inland Fisheries to 2025 consultation. A response was received following a previous consultation exercise, related to the same project, in 2021. In their response, IFI emphasized the importance of assessing all watercourses receiving drainage from the construction site. IFI also emphasized fuel and chemical storage protocols to prevent contamination and called for detailed geotechnical surveys assessing soil stability and landslide risks.	• Ch6 Biodiversity • Ch7 Land, Soils and Geology • Ch8 Hydrology and Hydrogeology
Leitrim County Council	Outlines potential effects on land, soils, and geology from the proposed development require robust site investigation and mitigation. The EIAR should detail survey findings, material movements, peat and spoil handling, drainage impacts, and site-specific risks like landslide susceptibility—especially due to the upland, sloped context and recent local landslide history (Shass Mountain Peat Landslide). The chapter must demonstrate that all excavation, storage, and drainage proposals meet best practice and precautionary principles, ensuring protection from peat instability and pollution during and after construction.	• Ch7 Land, Soils and Geology • Ch8 Hydrology and Hydrogeology • Ch 15 Material Assets
Fermanagh and Omagh District Council (FODC)	Fermanagh and Omagh District Council (FODC) acknowledge the thorough Land, Soils and Geology assessment in the draft EIAR but recommends Peat Landslide Hazard and Peatland Heritage Impact Assessments to address geological stability and archaeological risks on peatlands, alongside consideration of hydrologically connected Areas of Special Scientific Interest (ASSI), e.g., Lough Melvin ASSI as sensitive receptors comparable to NHAs/pNHAs.	• Ch7 Land, Soils and Geology • Ch8 Hydrology and Hydrogeology

The issues raised in the aforementioned responses have been addressed within this chapter. Comprehensive geological, hydrological and hydrogeological assessments have been undertaken. Recommendations including the use of clear span bridges were incorporated into the design of the proposed wind farm.

7.2 METHODOLOGY

The baseline environment of the proposed wind farm site and its auxiliary areas (including the proposed grid connection route and works areas of the proposed turbine delivery route was thoroughly investigated through extensive desk studies and field inspections. The methodology involved a combination of desk research, site walkovers and intrusive investigations, such as trial pits, boreholes, gouge augers and peat probes.

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 7.5.1.

The assessment takes account of the design flexibility parameters (varying turbine dimensions) set out in Chapter 2. The assessment has taken account of the reasonable worst-case likely significant environmental effects from this defined flexibility. The reasonable worst-case likely scenario is considered to be representative of all potential permutations within the approved range of design flexibility parameters for the purpose of this topic. The reasonable worst-case likely scenario describes the conditions considered to represent the greatest potential environmental effects. The options within the approved design flexibility do not change the conclusions on likely significant effects for land, soils and geology due to the limited variation in turbine design.

7.2.1 Desk Study

A desk study of the study area (shown in Figure 7-1) was undertaken to collate and review background information of the receiving environment. The following publicly available data sources and datasets were consulted (accessed September 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 7.3.1.

In order to inform the assessment of the future baseline, a review was undertaken of the current county development plans (Leitrim and Sligo County Council County Development Plans, Common Agricultural Policy, Forestry Programme 2023-2027 and the National Development Plan 2021-2030). The National Development Plan 2021-2030 and the Forestry Programme 2023-2027 outline the policy for and investment to increase forestry cover. Investment is being provided to support the objectives of the National Biodiversity Action Plan 2023-2030,

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

including measures to combat the spread of invasive alien species, implement Local Biodiversity Action Plans and invest in Agri-environment schemes such as the Department of Agriculture, Food and the Marines' Agri-Climate Rural Environmental Scheme (Acres).

7.2.2 Field Surveys

As part of the assessment of the proposed project, a series of structured field investigations 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 13 walkovers were undertaken of the proposed wind farm site, GCR works areas and TDR accommodations to review the ground conditions and assess the topography and geomorphology. These were carried out in October 2020, July 2021, October 2021, December 2021, December 2024, January 2022, October 2022, July 2022, June 2024, January 2025, April 2025, May 2025, July 2025 and November 2025. Observations were used to guide the placement of exploratory locations and further investigative works.

Intrusive ground investigations (GI) were undertaken by specialist sub-consultants Ground Investigations Ireland (GII) and Causeway Geotech in a phased manner during 2021, 2024 and 2025. The objectives of the investigations were to determine the subsurface conditions at the proposed wind farm site including the distribution and depth of mineral soils and peat at key development locations. This data was used to inform the final layout design and the full GI reports can be located in Appendix 2-6 (A-C) Site Investigation Reports.

All exploratory locations were surveyed, and their positions and elevations were accurately recorded using standard coordinate and elevation references. Laboratory testing was conducted on samples collected and included geotechnical analysis of soil samples—covering moisture content, Atterberg Limits, particle size distribution, compaction characteristics, and pH—as well as rock testing for Point Load Index and Slake Durability. All testing was carried out in accordance with BS 1377 and relevant rock mechanics standards. The ground investigation was completed in accordance with Eurocode 7 – Geotechnical Design, Part 2 (EN 1997-2) and BS 5930:2015 – Code of Practice for Ground Investigations. Mineral subsoils and peat were logged according to BS: 5930 and Von Post Scale respectively.

Phase 1 – 2021

- Rotary core drilling was undertaken at two locations by GII in November 2021 supervised by TOBIN, which correspond to the proposed met mast location and proposed borrow pit 2. These boreholes were drilled to provide details on the depth of overburden and bedrock lithology/type.
- Trial pits were completed at thirty-six (36) locations, to a maximum depth of 4.1 m below site grades.
- Sixteen (16) Russian Samples were completed to a maximum depth of 15 m below existing site grades.
- Targeted walkovers were completed to support specific elements of the investigation.
- A peat depth assessment was undertaken in July 2021 using handheld peat probes, focusing on areas identified during the desk study and Phase 1 SI as potentially underlain by peat.

Phase 2 - 2024

- Rotary core drilling was undertaken at one (1) location by Causeway Geotech in September and November 2024, supervised by TOBIN, which correspond to the locations of proposed turbines T7. The borehole was drilled to provide details on the depth of overburden and bedrock lithology/type. Standard penetration tests were carried out at standard depth intervals using a split spoon sampler or solid cone attachment during the rotary core drilling.
- Trial pits were completed at three (3) locations, to a maximum depth of 3.5 m below site grades by Causeway Geotech during the Phase 2 site investigation works.
- Thirty-nine (39) peat augers were conducted onsite by Causeway Geotech during the 2024 site investigation using an Edelman auger to a target depth of 2.00 metres or refusal. A follow-on peat probe was carried out if peat extended past 2.00 metres. The depth to this refusal was nominally taken as the thickness of peat at that location.
- A geophysical survey was completed by Apex Geophysics on the 7th of October 2024. The geophysical investigation consisted of 2D Electrical Resistivity Tomography and 2D Seismic Refraction profiling.

Phase 3 – 2025

- Rotary core drilling was undertaken at two (2) locations to a maximum depth of 12.8 mbgl, by GII in October 2025, supervised by TOBIN, which correspond to the locations of proposed borrow pit 2. The borehole was drilled to provide details on the depth of overburden and bedrock lithology/type. Standard penetration tests were carried out at standard depth intervals. One (1) of the rotary core drilled boreholes was finished as a groundwater monitoring well to enable water sampling and the determination of the equilibrium groundwater level.
- Trial pits were completed at eight (8) locations, to a maximum depth of 3.2 m below site grades by GII during the Phase 3 site investigation works.
- Ninety-seven (97) peat probes were conducted onsite in December by GII during the 2025 site investigation. The test consists of manually driving a cone on metre long extendible rods into the peat until a stiffer deposit or an obstruction is encountered. The depth to this refusal was nominally taken as the thickness of peat at that location.
- Seventeen (17) peat augers were conducted onsite in December 2025, by GII. The corkscrew shaped tip of the sampler is inserted into the ground. The operator then manually turns the T handle while using their body weight to rotate the sampler into the ground. The corkscrew sampler fills with material as it is rotated into the ground. The hand auger recovers a 300 mm disturbed sample which is recovered from the exploratory hole, logged, sampled and photographed.

All field work was conducted in compliance with best practice standards and relevant guidance, with oversight from qualified geologists and engineers. The site investigation works outlined above locations are shown on Figure 7-13.

Laboratory testing was conducted on samples collected and included geotechnical analysis of soil samples—covering moisture content, Atterberg Limits, particle size distribution, compaction characteristics, and pH.

7.2.3 Assessment Methodology

The approach to impact assessment proposed in IGI (2013) and EPA (2022) is adopted for the evaluation of potential effects on the receiving environment, with a focus on the likely significant effects. The proposed wind farm study area for the land, soils and geology assessment is outlined in Figure 7-1 and includes the TDR accommodations required for the southern site entrance and has been defined on the basis of a 2 km radius from the proposed wind farm site, as recommended in the IGI (2013). The study area for the accommodations along the proposed TDR and proposed GCR work areas use a 200 m buffer, based on the limited works and best practice based on professional judgement – See Figure 7-2 and 7-3 respectively.

Following on from the identification of the baseline environment, the available data was utilised to identify and categorise Likely significant effects on the land, soils and geological environment as a result of the proposed project. These assessments are undertaken by:

- Undertaking materials calculations in terms of volumetric soil and subsoil excavation and reuse associated with the design of the proposed project;
- Assessing ground stability risks, in particular peat stability (if present);
- Assessing the combined data acquired and evaluating any likely effects on the soils, geology and ground stability; and
- Identifying likely significant effects and considering measures that would mitigate or reduce the identified effects.

Following completion of the desk study and baseline assessment, the importance/sensitivity of the identified land, soils and geological receptors was assessed using the sensitivity criteria specified in Appendix C of the NRA Guidelines (2008), (refer to Table 7-2).

Table 7-2: Estimation of the Importance of Land, Soils and Geology Attributes (NRA, 2008)

Sensitivity	Criteria	Typical Example
Very High	Attribute 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 (NHA). Large existing quarry or pit. Proven economically extractable mineral resource
High	Attribute 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	Attribute 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. Sub-economic extractable mineral resource
Low	Attribute 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.

Magnitude of Effects

The magnitude of any effect evaluates the likely scale of the predicted change to the baseline conditions, resulting from the predicted effect and considers the duration of the effect i.e., temporary or permanent. The criteria for determining magnitude of effect are provided in Table 7-3. Potential effects may have a negative, neutral or positive effect on the land, soils and geological environment. In accordance with EPA Guidelines (2022) on the Information to be Contained in Environmental Impact Assessment Reports, this report adopts the term 'effect' to describe changes arising from the proposed project, rather than the term 'impact' which is utilised in NRA guidance.

Table 7-3: Criteria to Determine the Magnitude of Effect and Examples (NRA, 2008)

Magnitude[6]	Criteria	Typical Examples[7]
High Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves. Irreversible loss of high proportion of local 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 beneath alignment.

[6] EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports

[7] Based on Box 5.1 from the NRA Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (2008)

Magnitude[6]	Criteria	Typical Examples[7]
Medium Adverse	Results in impact on integrity of attribute or loss of part of attribute	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 beneath alignment.
Low Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	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. 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 attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Low Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature Remediation of a small, contaminated site (<1ha)
Medium Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature Remediation of a medium, contaminated site (<2.5ha)
High Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature Remediation of a large, contaminated site (>2.5 ha)

Significance of Effect

The significance of effects of the proposed project on the land, soils and geological environment has been assessed in accordance with the EPA (2022).

An Impact Assessment Matrix (IAM) is used to determine the significance of an effect. In basic terms, the potential significance of an effect is a function of the sensitivity of the receptor and the magnitude of the impact as shown in Table 7-4.

The matrix provides a framework for the consistent and transparent assessment of predicted effects across all technical chapters; however, it is important to note that individual assessments are based on relevant guidance and the application of professional judgement.

The matrix provides levels of significance of effects ranging from Imperceptible to Profound, as defined in the EPA EIAR Guidelines (2022). For the purposes of this assessment, effects rated as being "Significant- Moderate" or above are considered to be significant in EIA terms. 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 7-4: Impact assessment matrix for determination of significance of effect

Sensitivity of Receptor	Magnitude of Effects			
	High Adverse/ Beneficial	**Medium Adverse/ Beneficial**	**Low Adverse/ 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

7.2.4 Assumptions and Limitations

No overarching assumptions or limitations have been identified that apply to the assessment for Land, Soils and Geology. Where direct access was limited for intrusive ground investigation due to the presence of dense afforestation/wind fall areas, trial pits were relocated to the nearest suitable locations. Where routine assumptions have been made while undertaking the assessment, these are noted in the following sections.

7.3 EXISTING ENVIRONMENT

The existing environment within the study area, as defined in Section 7.1.2, is described in terms of geomorphology (landscape and topography), superficial and solid geology, and peat stability. The study area is described in Section 7-2 above and outlined in Figure 7-1 to Figure 7-3.

7.3.1 Desk Study

7.3.1.1 Geomorphology

Proposed wind farm site

The proposed wind farm site is located in a relatively mountainous area, with Saddle Hill in the northwest of the site and Dough Mountain located within and along the eastern site boundary. The proposed wind farm site stretches through the valley between these two elevated areas and

gently rises to the north. The southern portion of the site is where elevation is lowest. As the site extends northwards through the valley between the two mountains, the elevation rises steadily. The eastern section of the study area is mapped as mountain plateau, while the western section is mapped as mountain ridge, according to GSI physiographic mapping.

No karst features are mapped on the GSI karst database[8] within the study area. A total of 76 unmapped karst features were mapped using aerial photograph, lidar data and site walkovers in the wind farm study area, to the west of Dough Mountain as detailed in Section 7.2.1. These karst features mainly include dolines (enclosed depressions) with some sinking streams and swallow holes. On the slopes of Dough Mountain, there are a number of ribbed moraines and stream gullies that flow from the mountain peak in a radial manner. Many of the streams are altered on the upgradient areas, likely due to natural geomorphological and hydrological processes which modify the channels and flow characteristics over time.

Proposed GCR and accommodation areas on the proposed TDR

The GCR extends southward from the proposed substation location. The proposed GCR runs from the proposed substation southwest along the public road network for approximately 32 km to the existing ESBN 110/220kV Srananagh substation in Co. Sligo. GSI physiographic units are broad-scale regions mapped by Geological Survey Ireland to represent areas of physical landscape uniformity, based on features like geology, topography, elevation, slope, sediments, and landform history. These units help differentiate distinct terrain types. The proposed GCR is mapped as mountain ridge in the north to hill to rolling lowland bedrock ridge to drumlin and ribbed moraine topography at the southern section of the GCR.

The GCR is predominantly located in the local and regional roads. The proposed works along this route are limited areas, most of which are previously disturbed ground (e.g. at the edge of road surfaces). HDD (Horizontal Directional Drilling), is proposed on the River Bonet crossing. The locations range from flat to gently sloping. In total there are Eleven (11) proposed existing bridge crossings, of which eight (8) will involve in-road HDD (Horizontal Directional Drill), two (2) will involve off-road HDD and one (1) will be a standard crossing within the bridge deck.

The TDR accommodation areas are also limited to localised places, most of which are previously disturbed ground or located along local and regional roads. The TDR runs from Killybegs to Manorhamilton, via Sligo, prior to the proposed wind farm site.

7.3.1.2 Land Uses

Proposed wind farm site

The land uses/activities within the study area comprise lands principally occupied by forestry and agriculture, and small areas of natural vegetation. Commercial coniferous forestry is present throughout the site, with a northwestern portion area mapped as moors and heathland, according to the CORINE land cover map. Clusters of grassland pastures occupy the centre, northwest and southeast, as well as portion of the southern entrance to the proposed wind farm site.

[8] https://gsi.geodata.gov.ie/portal/apps/webappviewer/

There is an extensive network of existing internal access tracks and public roads across the proposed wind farm site to facilitate the ongoing forestry operations. A number of public roads are present within the wind farm site boundary. One operational wind farm containing three turbines (Faughary) is located to the south of T3.

Proposed GCR works areas and TDR accommodations

The GCR works areas and TDR accommodations follow existing road infrastructure, with the exception of the southern site entrance TDR works which have been assessed within the wind farm study area. The GCR will be primarily within the road corridor with some off-road works to facilitate watercourse crossings at the Bonet River Crossing and the access track at the wind farm entrance. The CORINE landcover mapped at the TDR works area at the wind farm entrance is agricultural land. The CORINE landcover mapped at the HDD crossing works are mapped as agricultural land, with significant areas of natural vegetation. TDR accommodations will involve minor modifications (e.g. temporary widening and hedgerow trimming, street furniture removal) at specific locations along the road corridor - See Appendix 3-1.

7.3.1.3 Soils and Subsoils

Proposed wind farm site

The soil information for the study area was sourced from the EPA/Teagasc Soils Information System and the supporting Teagasc Soil and Subsoil classification dataset (Accessed September 2025). The dominant soil type at the proposed wind farm comprises poorly drained acidic soils to the south and cutover blanket peat to the north (see Figure 7-4 to 7-6). The Teagasc Soil mapping indicates that the proposed wind farm encompasses six distinct soil types derived mainly from non-calcareous parent materials:

- AminPD - mineral poorly drained (Mainly acidic);
- BkPt – Blanket peat
- AminPDPT- Peaty poorly drained mineral (Mainly acidic)
- AminSP-Shallow poorly drained mineral (Mainly acidic)
- AlluvMIN – Alluvial (mineral)
- BminSP-Shallow poorly drained mineral (Mainly basic)

The soils underlying the proposed substation area are classified as deep, well-drained mineral soils (AminPD), corresponding to Surface water gleys.
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/topsoil.

The following subsoils and Quaternary sediments are present within the site boundary (Figure 7-7 and 7-9):

- Blanket Peat (BktPt);
- Till Derived from Namurian Sandstones and Shales (TNSSs);
- Till Derived from Limestone (TLs);
- Scree;
- Karstified Bedrock Outcrop or subcrop (KaRck);
- Bedrock outcrop or subcrop (Rck);

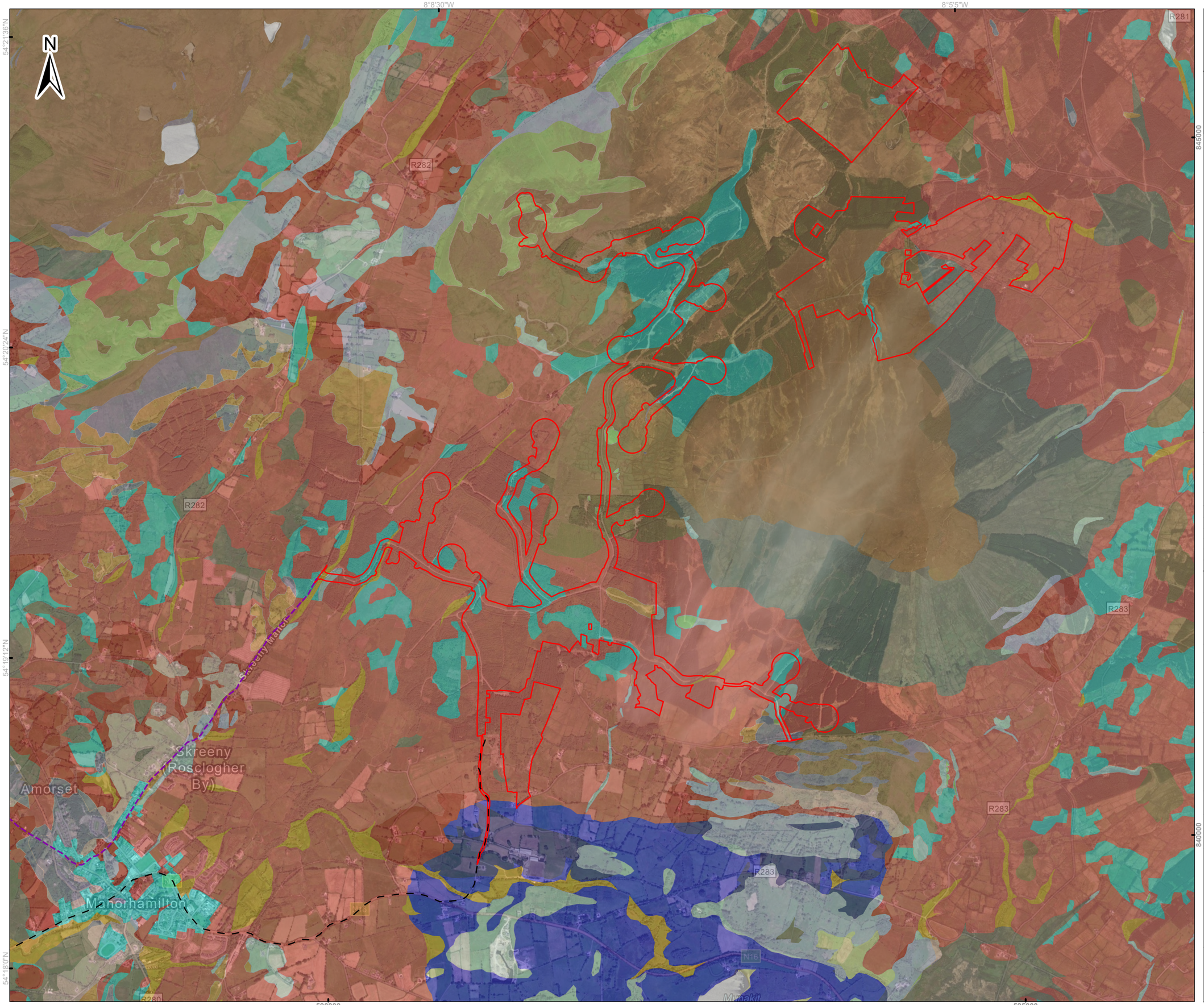
- Alluvium (A).

The majority of the northern portion of the site is mapped as blanket peat, with the southern section of the site dominated by till derived from Namurian sandstone and shales. Site investigations undertaken within the proposed wind farm site indicate that peat depths vary from 0.1 m to 4.5 m in the north and 0.1 m to 1.8 m in the south. Alluvium is mapped along the streams to the centre and south of the site and is typically well sorted, loose silt and sand sized particles. Scree is also located to the west of the proposed wind farm site along the slopes of Dough Mountain; however, the proposed wind farm layout has avoided the scree areas. A portion of the southern site entrance works areas are mapped as deep well drained mineral and deep poorly drained soils derived from mainly both calcareous parent material and non-calcareous parent material, which are underlain by till material deposited by or from glacial ice.

Proposed GCR works areas and TDR accommodations

The proposed GCR is along local roads (Made Ground) with a small section of off-road cable at two off-road HDD crossing points, adjacent to the L4165. The subsoils are mapped as glacial till and alluvium, post glacial sand and gravel deposits. The soils are further classified as deep poorly drained mineral soil derived from mainly acidic parent materials and mineral alluvium soils.

The TDR accommodation areas follows existing road infrastructure as previously discussed. The TDR accommodation areas relate to minor alterations with the road corridor which generally are described as poorly drained soils, along with a section of off road to the south of the wind farm which is described as deep poorly drained mineral soil derived from mainly non-calcareous parent material. The local soils and subsoils in relation to the proposed GCR and TDR study area are illustrated in Figure 7-5 to 7-9.



Legend

- Application Boundary
- Grid Connection Route
- Turbine Delivery Route

Soils

- AlluvMIN - Mineral alluvium
- 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
- AminSPPT - Peaty Gleys Shallow
- AminSRPT - Podzols Peaty
- AminSW - Lithosols / Regosols
- BktPt - Blanket peat
- BminDW - Grey Brown Podzolics / Brown Earths Basic
- BminPD - Surface water Gleys / Ground water Gleys Basic
- BminSP - Surface water Gleys / Ground water Gleys Shallow
- BminSPPT - Peaty Gleys Shallow
- BminSRPT - Lithosols Peats
- BminSW - Renzinas / Lithosols
- Cut - Raised Bog cutaway/cutover
- Lac
- Made
- Scree
- Water

0 0.5 1
Kilometers

Spatial Reference
Datum: IRENET95
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Rev	Date	Description	By	Chkd.
A	18/02/2026	First issue	S.P	S.R

Client:

Ireland FuturEnergy

Project:

Lissinagroagh Wind Farm

Title:

Figure 7-4:
Soils Map – Proposed Wind Farm

Scale @ A3: 1:25,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	February 2026

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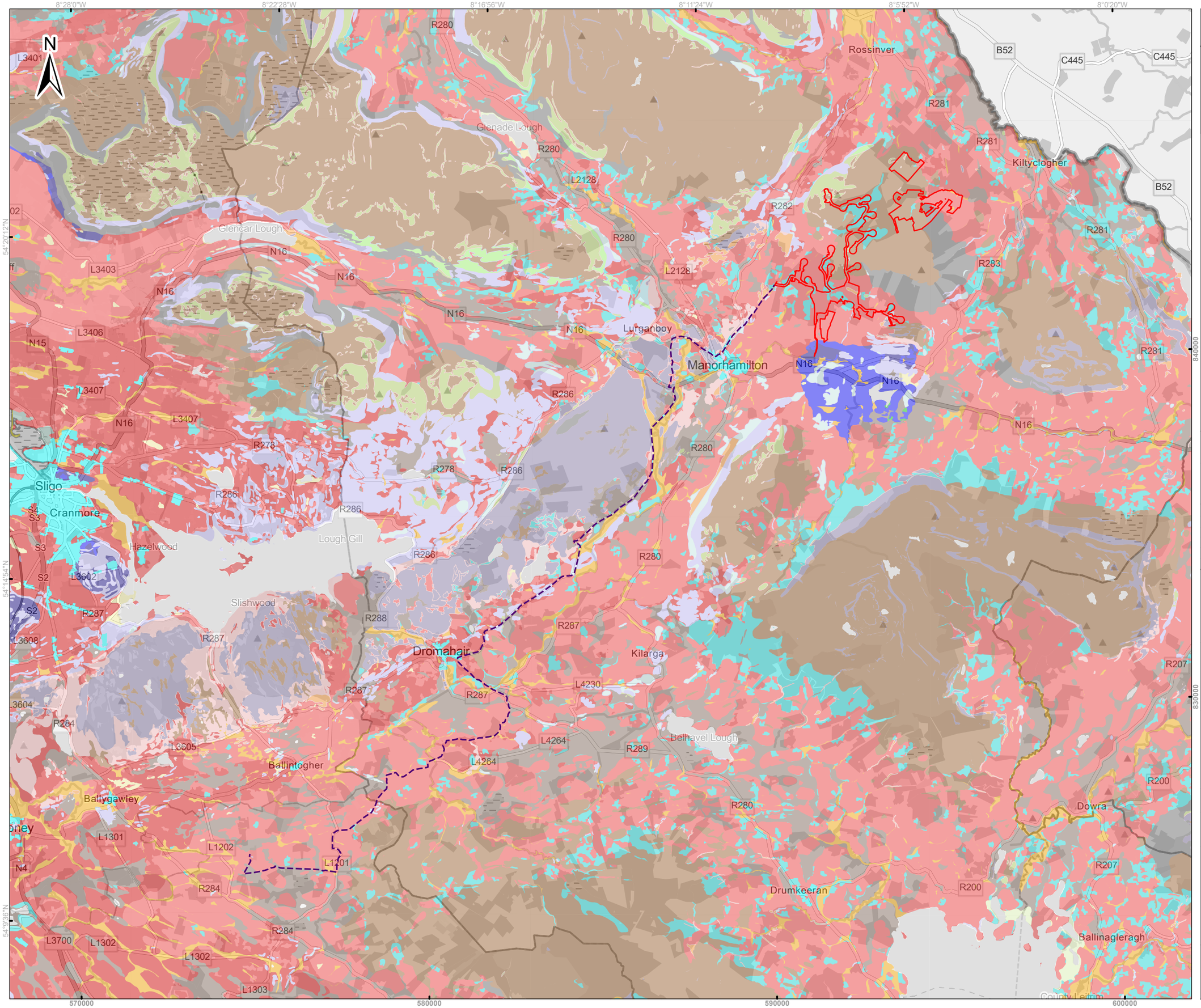
Map Ref: 10955-057-SO-P.App.BO-TOB-A

Draft: A



Legend

- Application Boundary
- Grid Connection Route

Soils

- AlluvMIN - Mineral alluvium
- 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
- AminSPPT - Peaty Gleys Shallow
- AminSRPT - Podzols Peaty
- AminSW - Lithosols / Regosols
- BktPt - Blanket peat
- 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
- MarSands
- MarSed
- Scree
- Water

0 2 4
Kilometers

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Ireland
FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-5
Soils Map - Proposed Wind Farm and GCR

Scale @ A3: 1:100,000

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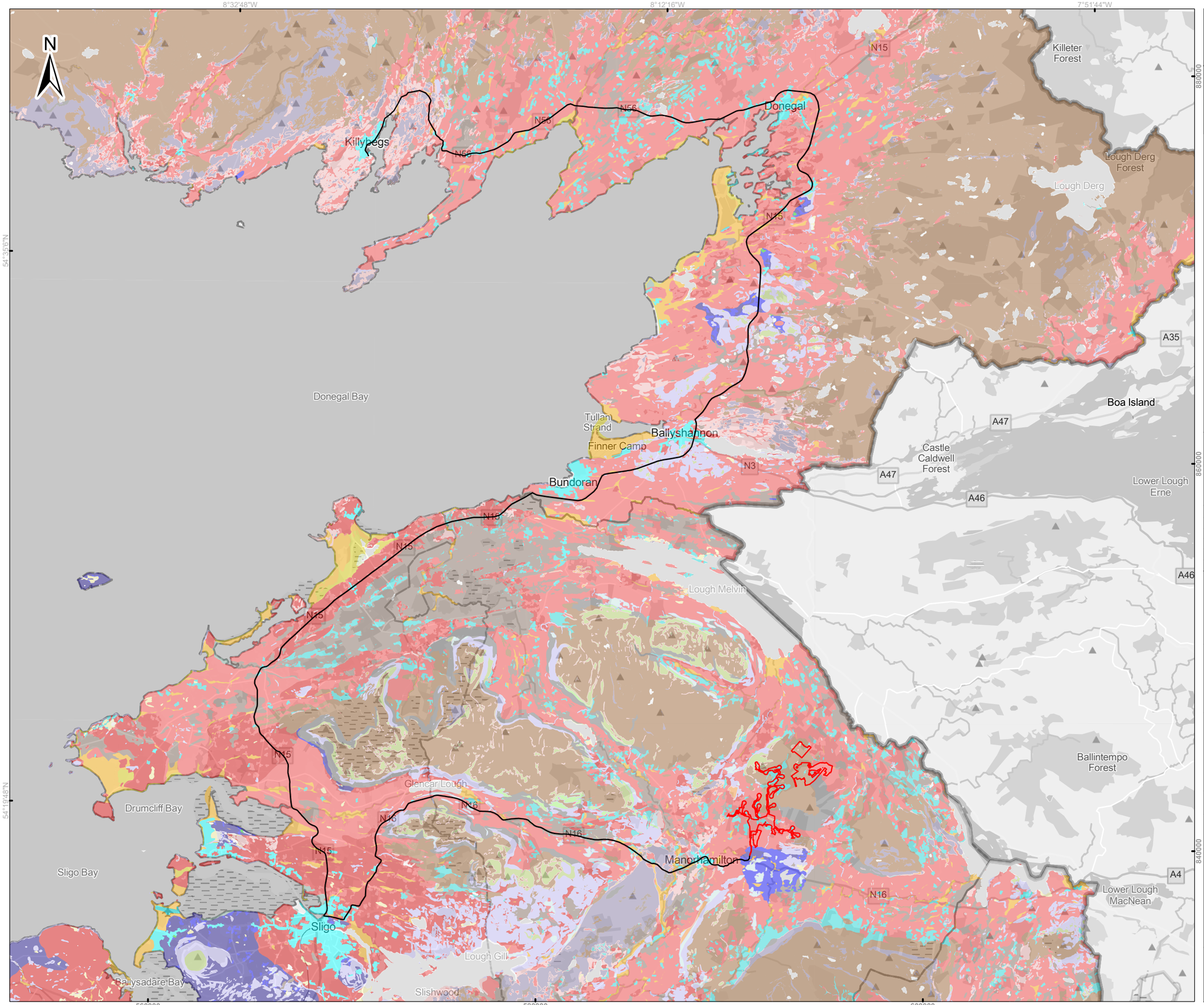

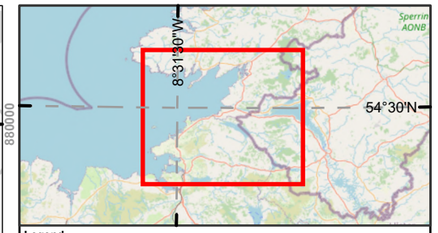

Legend

- Application Boundary
- Turbine Delivery Route

Soils

- AeoUND - Aeolian Undifferentiated
- AlluvMIN - Mineral alluvium
- 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
- AminSPPT - Peaty Gleys Shallow
- AminSRPT - Podzols Peaty
- AminSW - Lithosols / Regosols
- BktPt - Blanket peat
- 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
- MarSands
- MarSed
- Scree
- Water

0 5 10
Kilometers

Spatial Reference
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Client: FuturEnergy Ireland

Project: Lissinagroagh Wind Farm

Title: Figure 7-6: Soils Map – Proposed Wind Farm and TDR

Scale @ A3: 1:180,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	March 2026

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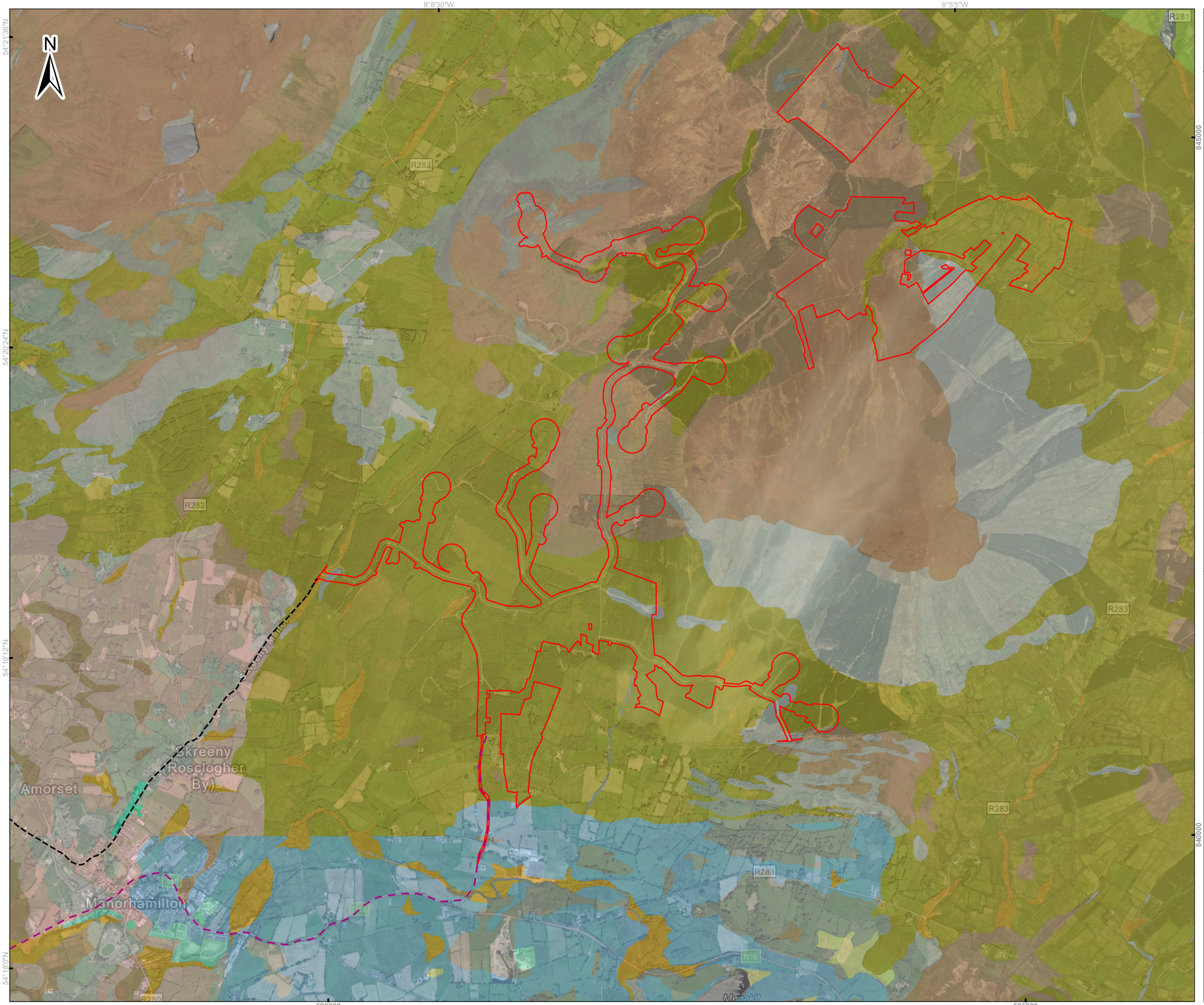

Legend

- Application Boundary
- Grid Connection Route
- Turbine Delivery Route

Subsoils

- A, Alluvium
- BktPt, Blanket Peat
- Cut, Cut over raised peat
- Fill, Made ground
- KaRck, Kartsified bedrock outcrop or subcrop
- L, Lacustrine sediments
- Rck, Bedrock outcrop or subcrop
- Scree, Scree
- TLs, Till derived from limestones
- TMp, Till derived from Metamorphic rocks
- TNCSSs, Till derived from Namurian and Carboniferous sandstones and shales
- TNSSs, Till derived from Namurian sandstones and shales
- Urban
- Water

0 0.5 1
Kilometers

Spatial Reference
Datum: IRENET95
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A	18/02/2026	First issue	S.P	S.R

Client:
Ireland
FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-7:
Subsoils Map -
Proposed Wind Farm

Scale @ A3: 1:25,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	February 2026

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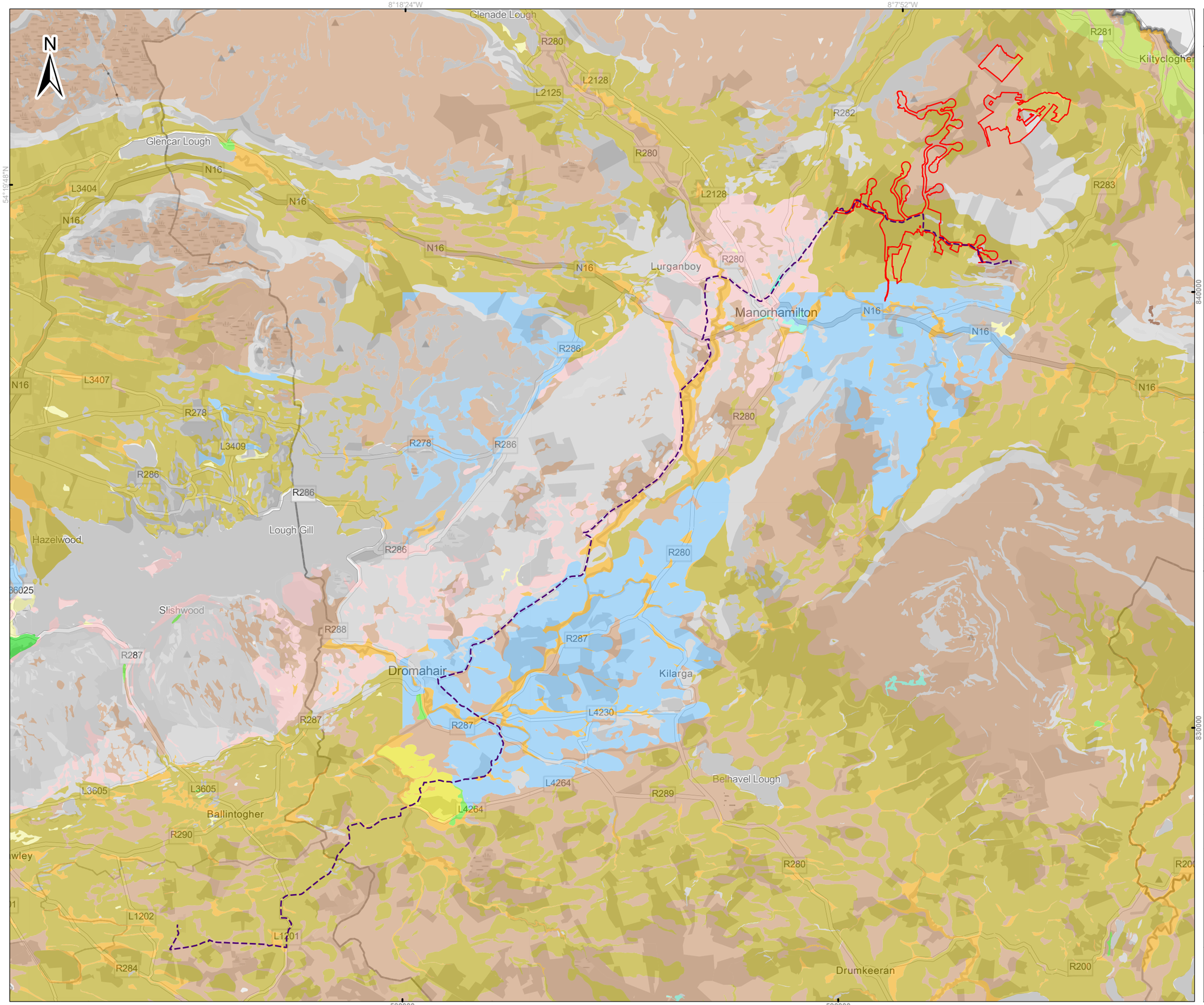

Legend

- Application Boundary
- Grid Connection Route

Subsoils

- A, Alluvium
- Ag, Alluvium (gravelly)
- BktPt, Blanket Peat
- Crannog, Crannog
- Cut, Cut over raised peat
- FenPt, Fen Peat
- Fill, Made ground
- GLs, Gravels derived from Limestones
- GMp, Gravels derived from Metamorphic rocks
- GNSSs, Gravels derived from Namurian sandstones and shales
- KaRck, Kartsified bedrock outcrop or subcrop
- L, Lacustrine sediments
- Rck, Bedrock outcrop or subcrop
- Scree, Scree
- Spoil Heap, Spoil Heap
- TCh, Till derived from cherts
- TLs, Till derived from limestones
- TMp, Till derived from Metamorphic rocks
- TNCSSs, Till derived from Namurian and Carboniferous sandstones and shales
- TNSSs, Till derived from Namurian sandstones and shales
- Urban
- Water

0 2 4
Kilometers

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Client:
Ireland FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-8:
Subsoils Map – Proposed Wind Farm and GCR

Scale @ A3: 1:80,000

Prepared by:	Checked by:	Date:
S.P	S.Ryan	February 2026

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Map Ref: 10955-058-SSO-GCR-TOB-A

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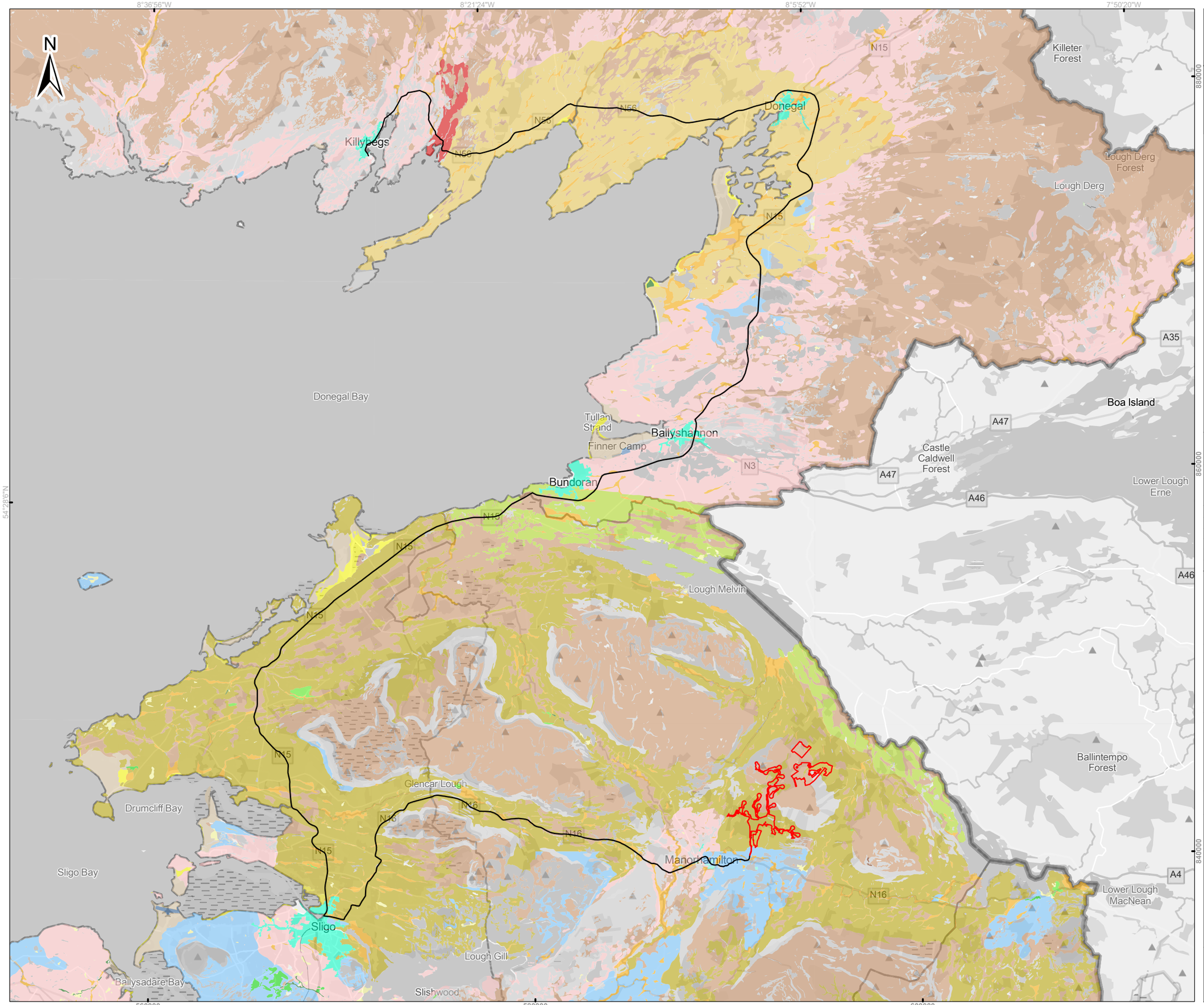

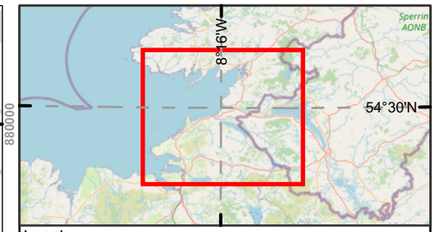

Legend

- Application Boundary
- Turbine Delivery Route

Subsoils

- A, Alluvium
- Ac, Alluvium (clayey)
- AcEsk, Eskers comprised of gravels of acidic reaction
- Ag, Alluvium (gravelly)
- Airfield/Airport
- BasEsk, Eskers comprised of gravels of basic reaction
- BktPt, Blanket Peat
- Causeway, Causeway
- Crannog, Crannog
- Cut, Cut over raised peat
- FenPt, Fen Peat
- Fill, Made ground
- GLs, Gravels derived from Limestones
- GMp, Gravels derived from Metamorphic rocks
- GNSSs, Gravels derived from Namurian sandstones and shales
- Hardstand
- KaRck, Kartsified bedrock outcrop or subcrop
- L, Lacustrine sediments
- Mbs, Marine beach sands
- Mesc, Esturine silts and clays
- Pier
- Rck, Bedrock outcrop or subcrop
- Scree, Scree
- Spoil Heap, Spoil Heap
- TDCSsS, Till derived from Devonian and Carboniferous sandstones and shales
- TLCSsS, Till derived from lower Carboniferous sandstones and shales
- TLs, Till derived from limestones
- TMp, Till derived from Metamorphic rocks
- TNCSSs, Till derived from Namurian and Carboniferous sandstones and shales
- TNSSs, Till derived from Namurian sandstones and shales
- TdlMr, Tidal Marsh
- Urban
- Water
- Ws, Windblown sands
- Wsd, Windblown sands and dunes

0 5 10
Kilometers

Spatial Reference
Datum: IRENET95
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Client: Ireland FuturEnergy

Project: Lissinagroagh Wind Farm

Title: Figure 7-9: Subsoils Map – Proposed Wind Farm and TDR

Scale @ A3: 1:180,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	February 2026

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

Map Ref: 10955-013-SSO-TDR-TOB-A

Draft: A

7.3.1.4 Bedrock Geology

Proposed wind farm site

Information on the bedrock geology in the study area was obtained from the Geology of Sligo-Leitrim, Sheet No. 7 (1:100,000), available in the Geological Survey of Ireland (GSI) Web Viewer. The bedrock geology underlying the proposed Wind Farm site and GCR is shown in Figure 7-10 and 7-11. The bedrock geology underlying the TDR is shown in Figure 7-12.

The proposed wind farm site is underlain by a number of bedrock formations as detailed in Table 7-5. Bedrock outcrops are present across the proposed wind farm site, particularly concentrated to the north and center. Additionally, a number of geological faulting runs through the proposed wind farm site, often deliniating bedrock formations, which are described below.

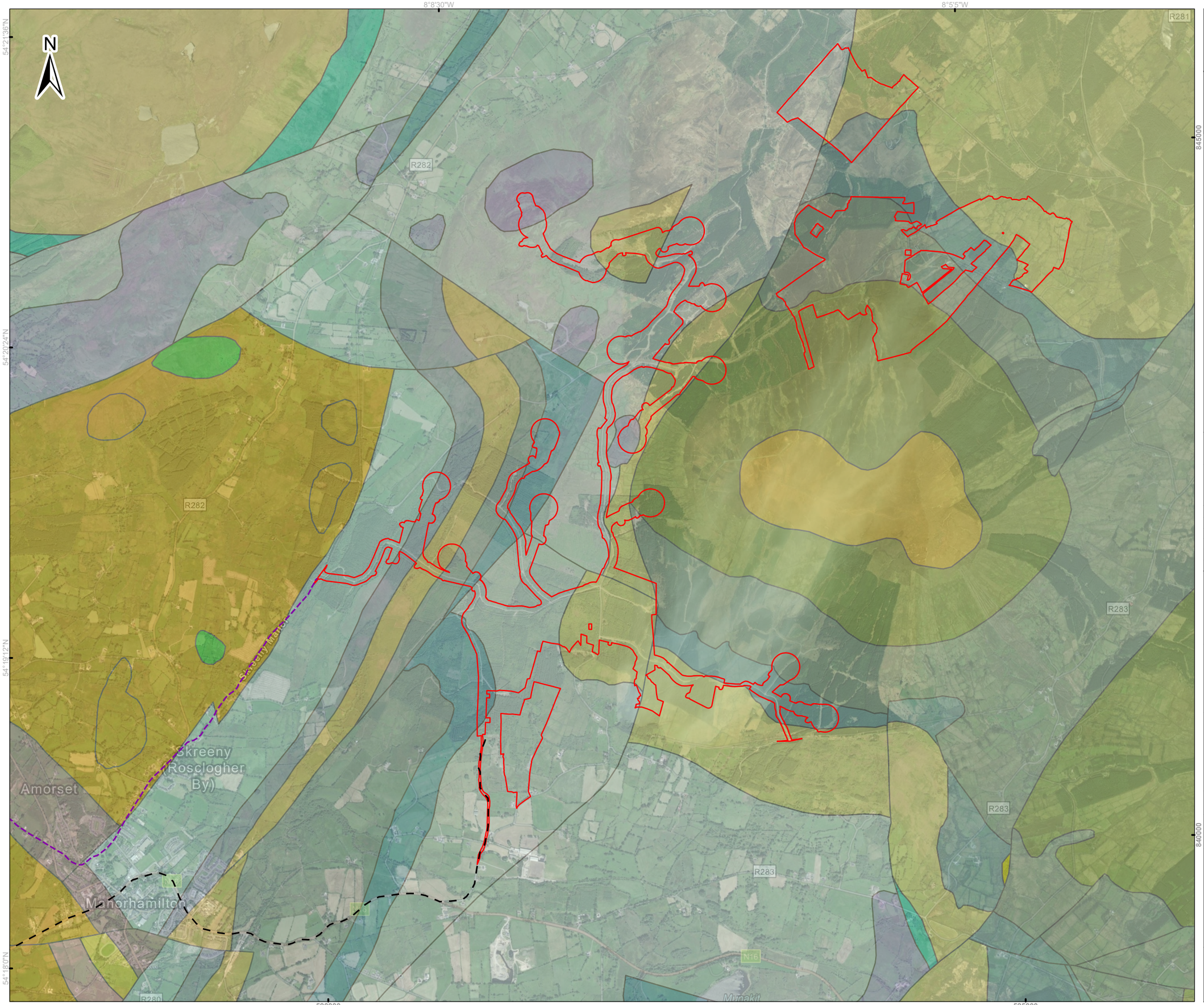
Table 7-5: Bedrock formations underlying the proposed wind farm site

Formation	Location	Lithology
Glenade Sandstone Formation	Southeast of the site and extends northwards through the centre of the site forming the western base of Dough Mountain.	Pale orthoquartzitic sandstone – Homogenous, thick bedded, medium-grained, orthoquartzitic, brown coloured sandstone with minor amounts of shale. Also contains impersistent coarse grained sandstone beds and pebble beds near the base.
Dartry Limestone Formation	Extends through the centre of the site and is the dominant lithology at the north of the site.	Dark fine-grained cherty limestone - The dominant facies is massive and thick-bedded, mostly very fine-grained and dark wackestone, locally rich in sponge spicules. Bedding is picked out by lines of chert nodules. There is pervasive dolomitisation and silicification also present.
Glencar Limestone formation	Southwest and west of the site.	Dark fine limestone and calcareous shale – The formation consists of an alternation of calcareous shales and limestones which range from argillaceous calcisiltites to very fine calcarenites. Cyclicity or rhythmicity occurs throughout. Individual composite limestone beds average 10-20cm in thickness.
Benbulben Shale Formation	Southwest and west of the site.	Calcareous shale with minor calcarenite – Consists primarily of laminated dark-grey calcareous shale, with subordinate ribs of argillaceous fine calcarenite or calcisiltite. Bioclastic debris is abundant, crinoid, brachiopod, solitary coral with large caniniids in the upper part, and bryozoans.
Mullaghmore Sandstone Formation	Southwest and west of the site.	Sandstone, siltstone and shale – The formation consists of a series of cyclical units of siltstones and shales which coarsen up into medium to coarse grained sandstones. Trace fossils are abundant and varied, particularly in the shale; siltstones and rippled fine sandstones occur. The upper part consists of sandy oolite, calcareous siltstone and thin limestones.
Bundoran Shale Formation	Southwest and west of the site.	Dark shale, minor fine-grained limestone - The Bundoran Shale formation comprises dark grey, fissile, calcareous and

Formation	Location	Lithology
		micaceous laminated mudstones and siltstones interbedded with thinly bedded blue, grey to dark grey bioclastic limestones. Some units of the limestones may be classified as packestones or grainstones.
Ballyshannon Limestone Formation	Southwest corner of the site.	Pale grey calcarenite limestone – Most of the formation is composed of medium to light grey, massively bedded crinoidal calcarenite. Stylolites are common and are often the only indication of bedding. Very dark grey fine calcarenites with black chert nodules are interspersed.
Bellavally Shale Formation	Southeast of the site on the southern slopes of Dough Mountain.	Grey micrite, shale, laminate evaporite - Calcareous shale and micritic limestone, with a marine fauna of goniatites, corals and productids; laminated dolomicritic or micrite with evaporite beds; grey green, often silty mudstone with calcareous concretions.
Carraun Shale Formation	Southeast of the site on the southern slopes of Dough Mountain.	Grey/black shale with minor limestone - The Formation is composed of grey to black fossiliferous shales and mudstones with thin subordinate limestones and dolomites.
Dergvone Shale Formation	Towards the centre and southeast of the site on the southern slopes of Dough Mountain.	Shale and minor turbiditic sandstone - The formation contains four main shale facies, arranged in rhythmical order.
Lacoon Flagstone Member of the Dergvone Shale Formation	Peak of Dough Mountain.	Interbedded sandstone and thin shale – Fine parallel-bedded sandstones with common groove casts are interbedded with grey micaceous silty shale.
Mudbank Limestone	In the centre of the site immediately to the adjacent west of the swallow holes and also occur as isolated regions in the northwest of the site.	Mudbanks limestone - Pale grey, massive to poorly bedded biomicrite (fine-grained limestone) composed predominantly of lithified lime mud.

Proposed GCR works areas and TDR accommodations

The work area along the GCR is underlain by the Lisgorman Shale Formation, which is described as thin-bedded calcareous shale, limestone. The geology underlying the work area of the proposed TDR at the proposed wind farm entrance includes several formations consisting of the Dartry and Glencar Formations. These formations are not anticipated to be exposed during the limited TDR accommodations and GCR works, which involve minor shallow activities typically confined to overlying Quaternary glacial till and topsoil.



Legend

- Application Boundary
- Grid Connection Route
- Turbine Delivery Route

Bedrock Geology

- Doobally Sandstone
- Bellavally Shale Formation
- Benbulben Shale Formation
- Ballyshannon Limestone Formation
- Bundoran Shale Formation
- Carraun Shale Formation
- Dartry Limestone Formation
- Glenade Sandstone Formation
- Glencar Limestone Formation
- Meenymore Formation
- Mullaghmore Sandstone Formation
- Dergvone Shale Formation
- Lacoon Flagstone Member
- Metabasite
- Mudbank limestone
- Leckee Quartzitic Formation
- Newantrim Member
- Meelick Member
- Slishwood Division, Psammitic Paragneiss

0 0.5 1
Kilometers

Spatial Reference
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EPSG: 2157

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Client:
Ireland
FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-10:
Bedrock Geology Map -
Proposed Wind Farm

Scale @ A3: 1:25,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	February 2026

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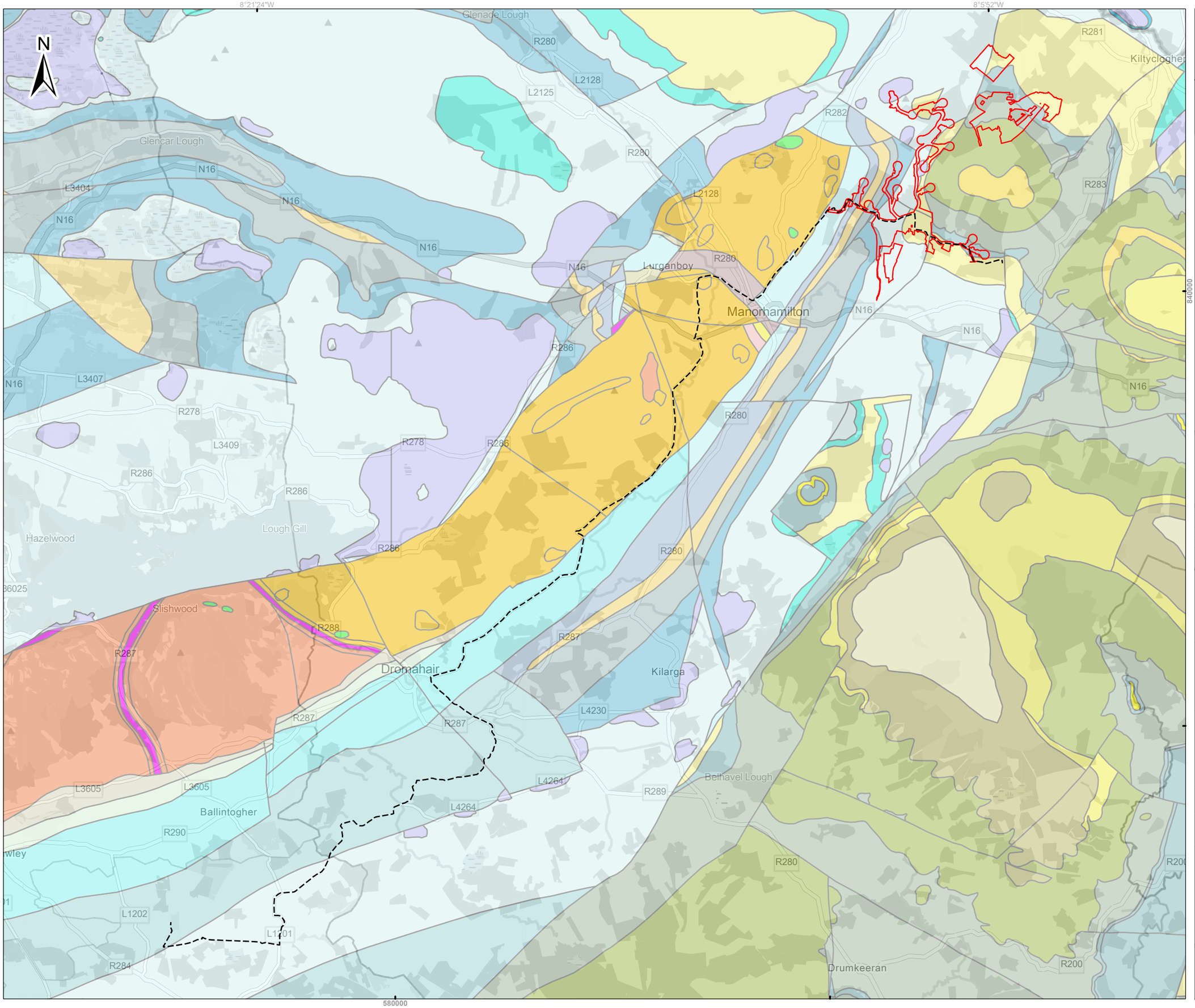
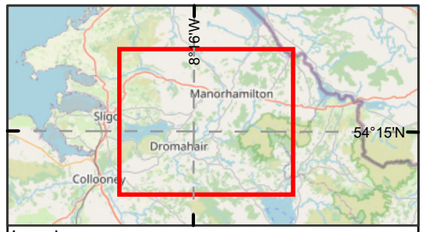
Map Ref: 10955-061-B.GEO-P.App.BO-TOB-A

Draft: A





Legend

- Application Boundary
- Grid Connection Route

Bedrock Geology

- Doobally Sandstone
- Bellavally Shale Formation
- Benbulben Shale Formation
- Bricklieve Limestone Formation (lower)
- in Bricklieve Limestone Formation
- Bricklieve Limestone Formation (upper)
- Ballyshannon Limestone Formation
- Bundoran Shale Formation
- Carraun Shale Formation
- Dartry Limestone Formation
- Knockmore Reef, bedded facies
- Knockmore Limestone Member
- Dargan Limestone
- Glenade Sandstone Formation
- Glencar Limestone Formation
- Lisgorman Shale Formation
- Meenymore Formation
- Moy Sandstone Formation
- Mullaghmore Sandstone Formation
- Oakport Limestone Formation
- Twigspark Formation
- Briscloonagh Sandstone Formation
- Dergvone Shale Formation
- Lacoon Flagstone Member
- Gowlaun Shale Formation
- Lackagh Sandstone Formation
- Metabasite
- Serpentinite
- Mudbank limestone
- Leckee Quartzitic Formation
- Newantrim Member
- Meelick Member
- Slishwood Division, Pelitic & semi-pelitic paragneiss
- Slishwood Division, Psammitic Paragneiss

0 2 4
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Client:
Ireland FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-11:
Bedrock Geology Map -
Proposed Wind Farm and GCR

Scale @ A3: 1:80,000

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S.Pezzetta	S.Ryan	February 2026

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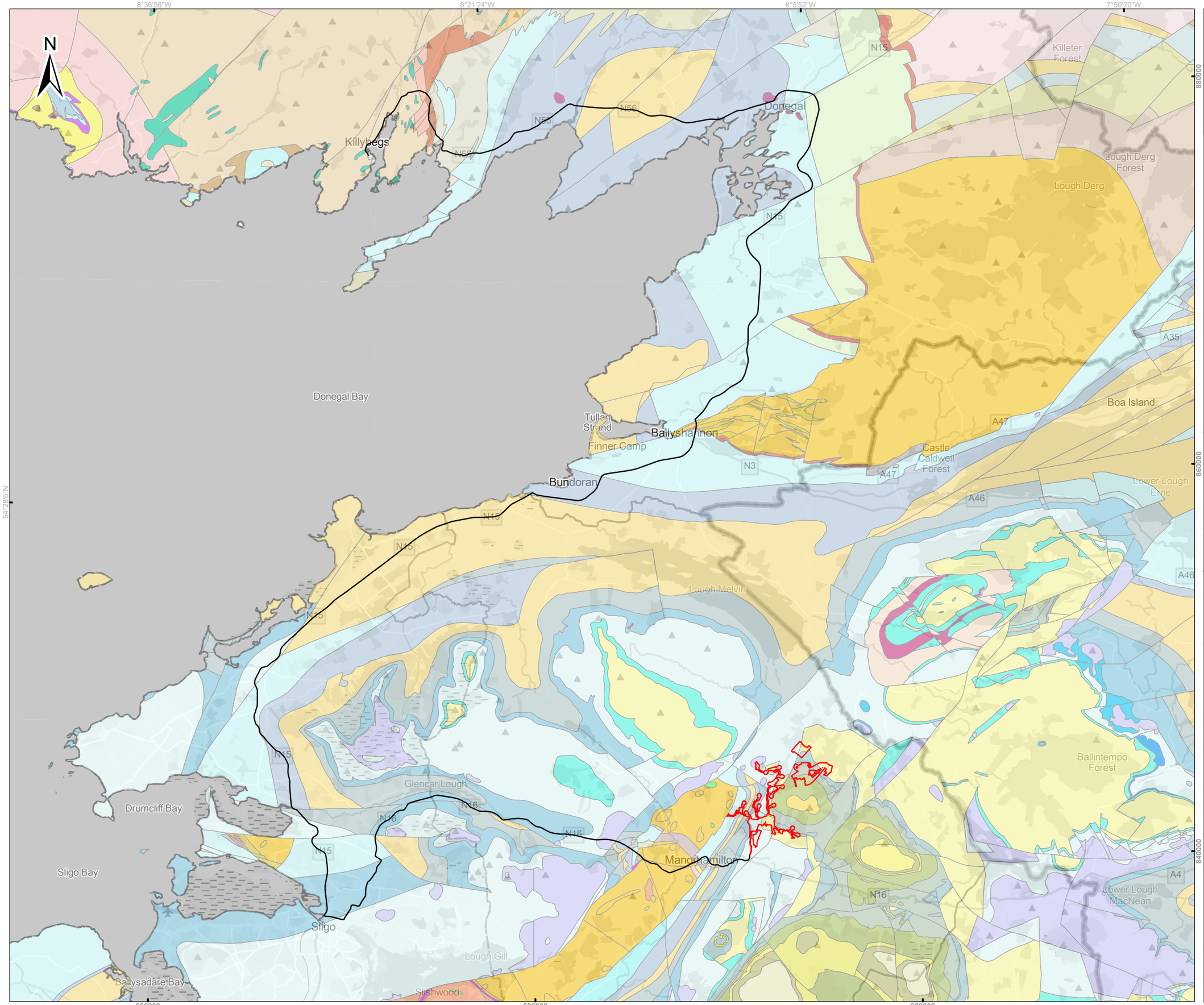
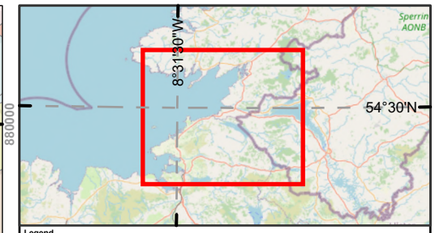
Draft: A





Legend

- Application Boundary
- Turbine Delivery Route

Bedrock Geology

- Aghyaran & Killygordon Limestone Fo
- Basal clastics
- Banagher Sandstone Formation
- Doobally Sandstone
- Bellavally Shale Formation
- Benbulben Shale Formation
- Bricklieve Limestone Formation (lower)
- in Bricklieve Limestone Formation
- Ballyshannon Limestone Formation
- Argillaceous limestones & calc. sha
- Basal sandstones
- Bundoran Shale Formation
- Carraun Shale Formation
- Doagh Limestone Member
- Claragh Sandstone Formation
- Dartry Limestone Formation
- Knockmore Reef, bedded facies
- Knockmore Limestone Member
- Carn Limestone Member
- Carrickmacsparrow Limestone Member
- in Dartry Limestone Formation
- Glenade Sandstone Formation
- Glencar Limestone Formation
- Keenaghan Shale Formation
- Killin Formation
- Meenymore Formation
- Glen Member
- Quarry Sandstone Member
- Moy Sandstone Formation
- Muckros Sandstone Formation
- Mullaghmore Sandstone Formation
- Oakport Limestone Formation
- Rinn Point Limestone Formation
- Twigspark Formation
- Croaghgarrow Formation
- Brisloonagh Sandstone Formation
- Dergvone Shale Formation
- Lacoon Flagstone Member
- Gowlaun Shale Formation
- Lackagh Sandstone Formation
- Edergole Formation
- Lough Eske Psammite Formation
- Gaugin Quartzite Formation
- Glencolumbkille Limestone Formation
- Glencolumbkille Pelite Formation
- Microgranite and related rocks
- Metabasite
- Serpentinite
- Killeter Quartzite Formation
- Lower Crana Quartzite Formation
- Slieve League Formation
- Lough Mourne Formation
- Appinite suite
- Dolerite
- Metadolerite
- Mudbank limestone
- Curraghnagark Member
- Doonweelin Member
- Grit Unit (Curraghnagark Member)
- Leckee Quartzitic Formation
- Liscarragh Formation
- Newantrim Member
- Meelick Member
- Mullyfa and Deele Formations
- Port Askaig Formation
- Slishwood Division, Semi-pelitic biotite schists
- Slishwood Division, Cregg House Formation
- Slishwood Division, Pelitic & semi-pelitic paragneiss
- Slishwood Division, Psammitic Paragneiss
- Slieve Tooey Quartzite Formation
- Termon Formation
- Dolerite and Gabbro

0 4 8
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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A	18/02/2026	First issue	S.P	S.R

Client:
Ireland FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-12:
Bedrock Geology Map -
Proposed Wind Farm and TDR

Scale @ A3: 1:180,000

Prepared by:	Checked by:	Date:
S.Pezzeta	S.Ryan	February 2026

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

Map Ref: 10955-015-B.GEO-TDR-TOB-A

Draft: A

7.3.1.5 Mineral/Aggregate Resources

Proposed wind farm site

The GSI database indicates there is one non-metallic mineral location (ID: 1614) approximately 1.1km to the east of T4 comprised of irregular sandstone units up to 2m thick in black shales, previously quarried for flagstones. There is a further non-metallic mineral location (ID: 1612) situated approximately 1.5km to the south of the proposed wind farm site comprised of bioclastic limestone with occasional chert nodules. No mapped mineral locations exist within the proposed wind farm site boundary.

Two non-metallic mineral locations (ID: 1619 and 1618) are mapped approximately 100 m north of the northwest study area boundary, within the townland of Gortnacrieve. Both locations are described as disused quarries with cherty limestone. One metallic mineral location (ID:2577) is located approximately 50 m north of the southwest study area boundary, comprised of outcrop of gneiss with veining of malachite and pyrite. An active quarry is located 1.5 km to the south of the proposed wind farm site, namely Tates (Kerrigan) Quarries (ID: LM 001), producing limestone rock, crushed stone, clean stone and sand.

Proposed GCR works areas and TDR accommodations

The GCR and the works area for the TDR traverse areas generally classified as having moderate to very high aggregate potential, with the southern section of the GCR mapped as having low crushed rock aggregate potential, according to available geological resource mapping.

8°8'30"W
8°5'5"W
54°21'36"N
54°20'24"N
54°19'12"N
845000
840000
590000
595000
N
R282
R283
Skreeny Manor
Skreeny (Rosclogher By)

Legend

- Application Boundary

2021
- Peat Probes

2022
- Peat Probes
- Trial Pits
- Gouge Auger
- Brash Lines

2024
- Trial Pits
- Gouge Auger
- Boreholes

2025
- Boreholes
- Gouge Auger
- Peat Probes
- Trial Pits
- Brash Lines

0 0.5 1
Kilometers

Spatial Reference
Datum: IRENET95
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Ireland FuturEnergy

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-13:
Site Investigation Location Map
Overview

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	March 2026

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

Map Ref: 10955-016-SI-S.BO-TOB-A_overview

Draft: A

7.3.1.6 Contaminated Land

Proposed wind farm site

An evaluation was undertaken to determine the presence and extent of potentially contaminated land or contaminated sites in the study area (using EPA historical data and the Section 22 Register). The Environmental Protection Agency (EPA) Ireland defines contaminated land as sites where soil or groundwater quality is adversely affected by substances that pose a risk to human health or the environment. This evaluation is based on the identification of potential sources, pathways and receptors. As the proposed wind farm site is predominantly covered in agricultural land and forestry, the potential for contamination is very low. No evidence of hydrocarbons was encountered during the site investigation works.

A review of the EPA website for existing and historic licensed and illegal waste activities, mines and industries was carried out to identify any potential contamination sources and any potential contaminating activities present within the study area of the proposed project.

The EPA online maps[9] contain a points dataset of the location of current licensed Waste facilities (including licensed, applied, surrendered, rejected etc.) and Industrial Emissions Licensing Facilities. These include landfills, transfer stations, hazardous waste disposal and other significant waste disposal and recovery activities. There are no waste facility licences recorded within the proposed wind farm study area boundary. There are no facilities with Industrial Emissions Licences within the proposed wind farm site boundary or within the 2km 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. There are no IPC licenced sites in close proximity to the proposed wind farm site study area. The nearest IPC licensed site (P0625-01) is located approximately 7 km from the southeast study area boundary.

Proposed GCR works areas and TDR accommodations

No evidence of contamination was encountered on the proposed GCR or TDR accommodation areas. There are no IPC licenced sites or Industrial Emission licensed sites in proximity to the proposed GCR or TDR accommodation areas.

7.3.1.7 Geohazards

Proposed wind farm site

Geohazards are geological and geomorphological conditions or processes that pose risks to human activity, infrastructure, and the environment. They include hazards such as landslides, subsidence, and karst features. For the purposes of this assessment, the focus is on geohazards related to karst and slope/peat stability, which are particularly relevant given the local geological context, while other potential geohazards (e.g. seismicity, coastal erosion) are not considered significant due to the site's inland location, low seismicity of the region, and absence of coastal terrain.

[9] https://gis.epa.ie/EPAMaps -accessed November 2025

Karst features

Karst features are formed from the dissolution of soluble rocks such as limestone and dolomite and characterised by underground drainage systems with sinkholes and caves.

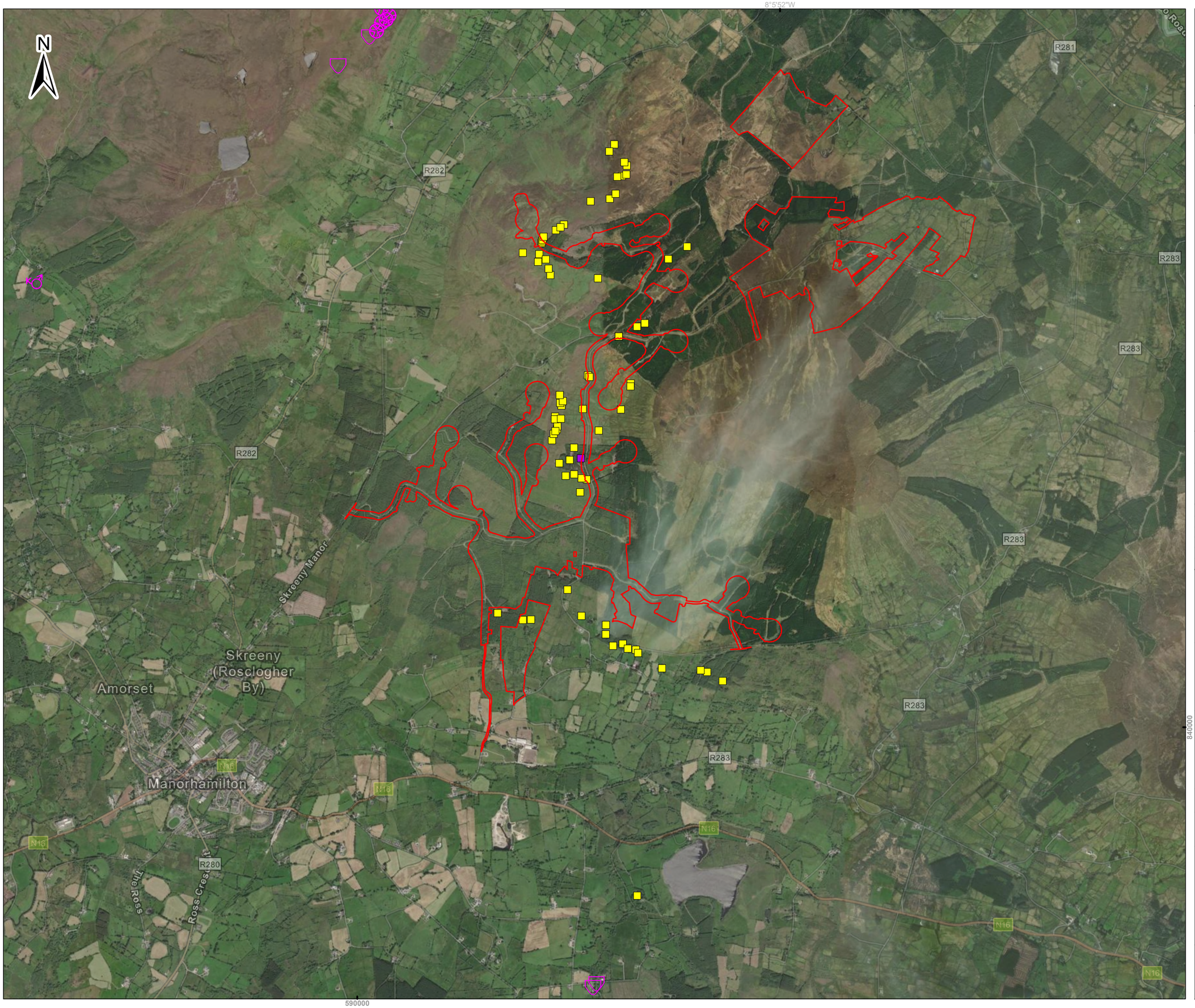
According to the GSI online viewer, there are no mapped karst features present with the proposed wind farm site boundary. Correspondence received from the GSI on December 16th, 2024, on geological heritage contained information regarding two swallow holes on the proposed wind farm site. A combination of information from the aerial mapping and site walkovers were used to identify and describe the karst features present in the study area. Site surveys indicated there are 76 possible karst features present within the study area. Information is included in Appendix 7-5 and shown on Figure 7-14 below. The proposed wind farm infrastructure footprint will not intercept any identified karst features, thereby avoiding potential impacts on these karst landforms which often function as important conduits for surface water recharge to the underlying aquifer system.

Enclosed depressions (dolines), which are typically 3-5m in diameter and swallow holes measuring almost 20 m to 30 m in diameter (Photo 1) have been identified (located to the east of T7) during the karst feature review at the proposed wind farm site. The swallow hole illustrated in Photo 1, is known as Polldough Cave. Polldough is a vertical pothole shaft, at the base of which is a recently explored cave 50 m deep. Similar karst features were also located 215 m to the northeast of T7 and 260 m to the south of Polldough. No karst features were encountered on infrastructure locations based on site walkovers and ground investigation data.

Proposed GCR works areas and TDR accommodations

No karst features have been identified within the boundary of the proposed GCR or works area on the proposed TDR.

Photo 1: Polldough Cave/ Swallow Hole



Legend

- Application Boundary

Karst Data 2025

- Shallow oval shaped depression
- Oval shaped depression

GSI mapped Karst Features

- Cave
- Enclosed Depression
- Spring

0 0.5 1
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Lissinagroagh Wind Farm

Title:

Figure 7-14:
Karst Features

Scale @ A3: 1:30,000

Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	February 2026

TOBIN

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

Map Ref: 10955-027-KA-P.App.BO-TOB-A

Draft: A

Peat and Slope Stability

Proposed wind farm sit

The GSI database provides information on locations, types, and frequencies of landslide events.

Using the GSI Landslides Database, there are no landslide events recorded within the proposed wind farm site boundary. The nearest recorded landslide event (GSI_LS06-0200), occurred 2.7 km south of the southern study area boundary. There is no recorded date as to when this landslide occurred. The southern slopes of Dough Mountain are characterised by two scree fall events, which are also recorded on the GSI database. These are located 2 km to the east of proposed turbine T14.

Consultation responses from Leitrim County Council highlighted a significant peat landslide event which occurred on the 28th of June 2020, on Shass Mountain, approximately 10 km southeast of the proposed wind farm. The landslide occurred within an area blanket bog on Shass Mountain, north-east of Drumkeeran, Co. Leitrim, approximately 1.2 km to 1.4 km upstream of the Dawn of Hope Bridge. The evacuated peat travelled within the existing watercourses where it resulted in flooding of the flood plain in the townlands of Corcormick and Derrindangan. The majority of the peat carried downstream of the Dawn of Hope bridge remains on these flood plains. The Diffagher River carried some peat sediment and other debris to Lough Allen, approximately 8.45km from the starting point, where it has washed up on the shoreline, e.g. at Corry Strand.

The GSI's landslide susceptibility mapping was used at a high level to assist in the identification of areas which are subject to landslides and is measured from low to high. The landslide susceptibility mapping is based on high level topographical, regional soils, geological and morphological information and is a good guide in the absence of more detailed site information. However, assessment of more detailed site information provides more a more robust representation of landslide susceptibility. The southern and central parts of the proposed wind farm site have been identified to be generally low in landslide susceptibility. The central and northern part of the proposed wind farm site have been identified as moderate to high susceptibility. Landslide susceptibility across the proposed wind farm is generally low at the proposed windfarm infrastructure locations. All turbine base locations and substation footprint are mapped as having 'Low' landslide susceptibility, except for T3, T4, T5, T7 and T8 turbine base locations mapped as having 'Low to Moderately High' landslide susceptibility.

Proposed GCR works areas and TDR accommodations

There are no recorded landslide events along the proposed GCR or at the proposed TDR accommodation areas.

7.3.1.8 Geological Heritage

Proposed wind farm site

The Geological Survey of Ireland (GSI) provides scientific appraisal and interpretative advice on geological heritage sites (GHS), and is responsible for the identification of important sites that are capable of being conserved as Natural Heritage Areas (NHA). Geological heritage is part of the natural heritage of a certain area constituted by geodiversity elements with particular

geological value and hence worthy of safeguard for the benefit of present and future generations (Geological Survey Ireland, 2025).

According to the GSI, there is a designated GHS which overlaps the eastern section of the proposed wind farm, namely Dough Mountain (Site Code: LM009) site. Dough Mountain is a large domed, upland ridge located c. 5km northeast of Manorhamilton on the eastern portion of the proposed wind farm site. Dough mountain GHS covers an areas of 10.26 km^2. GSI describes Dough Mountain as "*a particularly complex site in terms of its' geological history, and has an array of unusual karst features, upland ribbed moraines and straight-as-an-arrow stream gullies*".

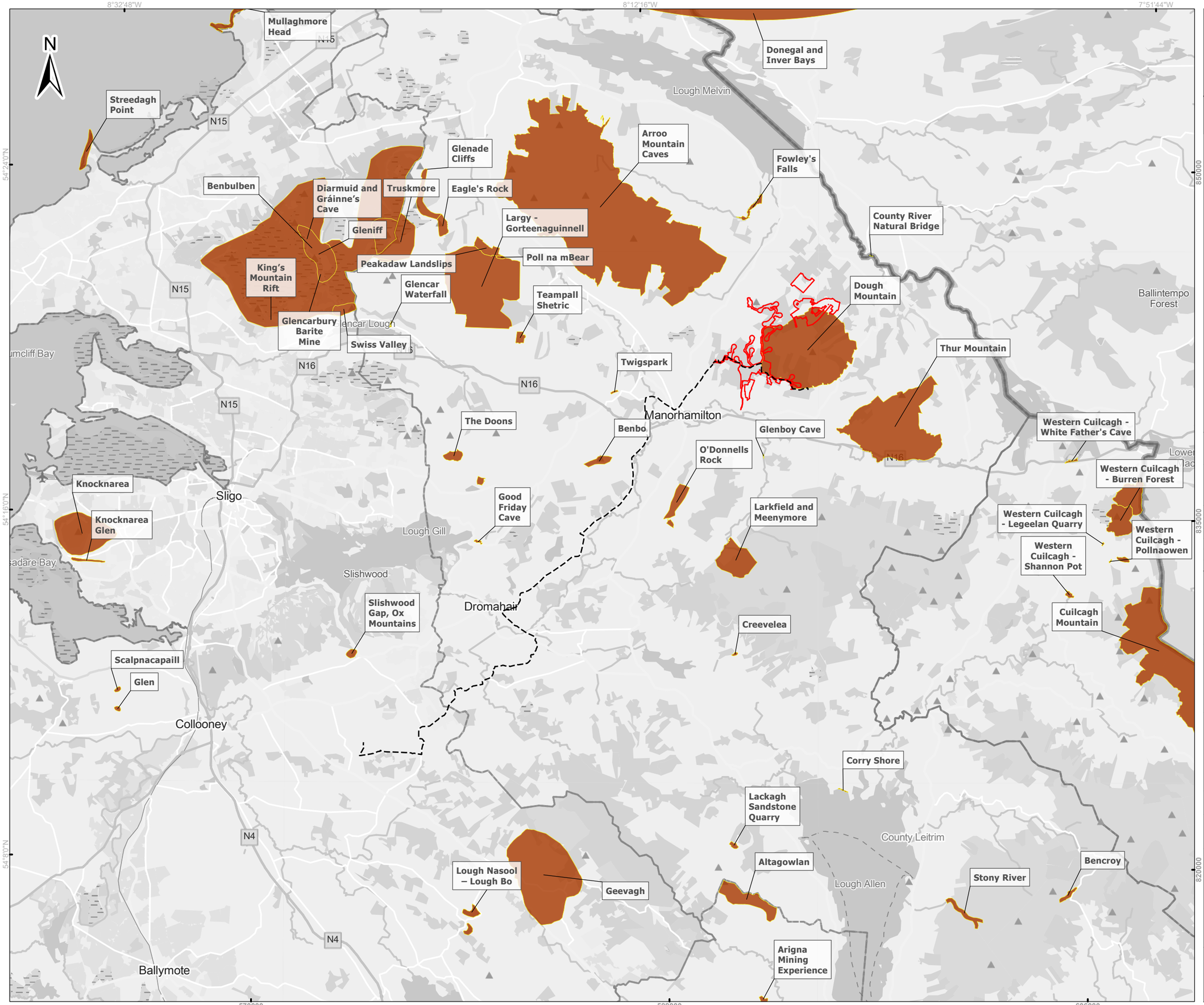
Leitrim is one of the few localities in the world where upland ribbed moraines occur, and they are particularly well expressed on the southwestern side of Dough Mountain, in Boleyboy townland, where the ridges are up to 1 km long, 300 m wide, and 15-20 m high. This ribbed moraine extends to the south towards Manorhamilton. The southeastern side of Dough Mountain has been blanketed in scree and other slope deposits. Borrow pit 2, Turbines 5, 6, 8, 13 and 14 are located in the Dough mountain GHS.

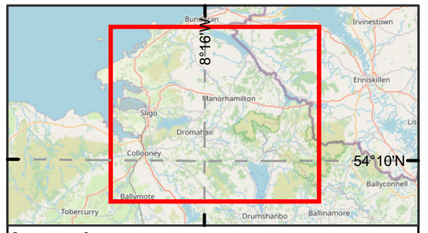
A second Geological Heritage Site is recorded approximately 3 km to the east of Turbine 14, outside the study area. This is Thur Mountain (Site Code: LM030), a domed upland ridge approxiamtely 8km east of Manorhamilton. This site has good exposures, in the gullies around the ridge, into Namurian sandstones and shales, and the gully channels have been important historically in mapping out the Namurian rocks of the region.

Several ASSIs are recorded to the north and northeast of the proposed wind farm site within Northern Ireland. These comprise Lough (Melvin ASSI140) (hydrologically connected to the site), Knocknashangan (ASSI297), Ross (ASSI299), Frevagh (ASSI400) and Rushy Hill (ASSI403), which collectively support diverse blanket bog, heathland, purple moor-grass and rush pasture and aquatic habitats of regional geological and ecological significance comparable to NHAs/pNHAs in the Republic of Ireland. The closest of these is mapped sites is approximatly 4 km to the northeast of the proposed windfarm site.

Proposed GCR works areas and TDR accommodations

There are no localised geological heritage sites on the GCR or TDR accommodation areas. However, Donegal and Inver Bays (Site Code DL011) GHS intersects a portion of the proposed TDR due to its large, mapped area. The geological area has not been refined and includes the national roads. It is described as a large area of rolling countryside forming the hinterland around Donegal and Inver Bays and covers an area of approximately 982 km^2.





Legend

- Application Boundary
- Geological Heritage

0 2.5 5 Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

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Client: FuturEnergy Ireland

Project: Lissinagroagh Wind Farm

Title: Figure 7-15: Geological Heritage Sites - Proposed Wind Farm and GCR

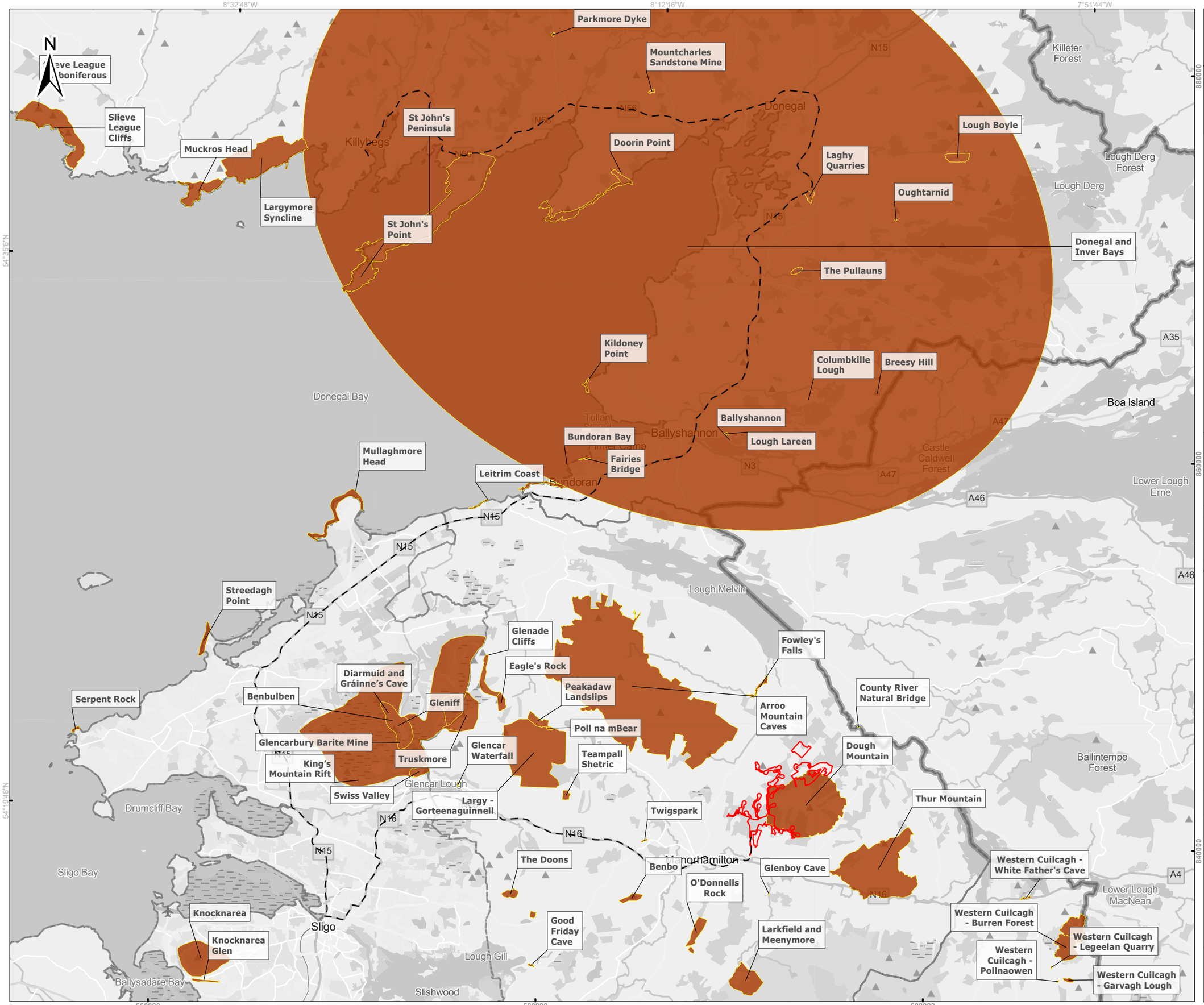
Scale @ A3: 1:150,000

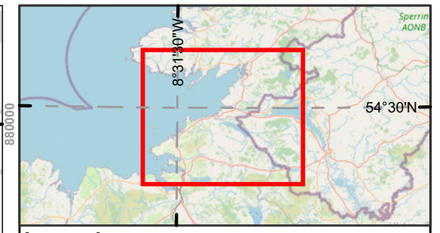
Prepared by:	Checked by:	Date:
S.Pezzetta	S.Ryan	February 2026

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

Map Ref: 10955-028-Geo.H-P.App.BO..GCR-TOB-A

Draft: A





Legend

- Application Boundary
- Turbine Delivery Route
- Geological Heritage

0 5 10
Kilometers

Spatial Reference
Datum: IRENET95
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Title:
Figure 7-16:
Geological Heritage Sites -
Proposed Wind Farm and TDR

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S.Pezzetta	S.Ryan	February 2026

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

Map Ref: 10955-059-Geo.H-TDR-TOB-A

Draft: A

7.3.2 Field Surveys

Intrusive ground investigations (GI) were undertaken by specialist sub-consultants Ground Investigations Ireland (GII) and Causeway Geotech in a phased manner during 2021, 2024 and 2025, as described in Section 7.2 above. Borehole and Trial Pit logs can be located within the ground investigation reports in Appendix 2-6. The GI results are summarised in Table 7-6, and the GI locations are shown in Figure 7-13. The geological data obtained from the GI and collated by TOBIN has been used in the preparation of this chapter.

Proposed wind farm site

The GI revealed that the wind farm site is predominantly underlain by gravelly till with peat mainly in the northern section in areas. Soil strength generally increases with depth, transitioning from soft or firm clay to stiff clay, often containing angular to subangular gravel and cobbles. The summary below (Table 7-6) presents the logged profiles and observations recorded at each exploratory location relevant to turbine and infrastructure positions.

Site investigations indicate that peat depths vary from 0.1 m to 4.5 m in the north and 0.1 m to 1.8 m in the south. The peat becomes deeper near T2 and T3, with depths varying between 0.2 and 4.5 meters. T4 also shows a range of peat depths from 0.3 to 2.55 meters. Towards the centre of the proposed wind farm site, from T5 to T10, peat depths vary between 0.3 and 2.0 meters. The southern area, near T13, has relatively shallow peat, with depths ranging from 0.2 to 0.4 meters. Finally, T14 exhibits peat depths ranging from 0.3 to 0.9 meters.

A total of 433 peat depths were recorded on the site. A statistical summary is included below in Table 7-6.

Table 7-6: Statistical summary of Peat Depths

	Number	25%ile (m)	50%ile (m)	75%ile (m)	95%ile (m)	99% (m)
Peat Depths	433	0.3	0.6	1.1	2.37	3

The ground investigations along with the site walkovers and peat probing confirmed the general geology indicated in the geological mapping of the proposed wind farm site. The ground investigations indicated that the proposed wind farm site is generally covered in a thin layer of shallow peat which often overlies sandy, gravelly and silty clay.

The seismic velocities obtained from the geophysical survey completed within the bedrock illustrated areas of slightly decreased resistivity values of 500-1,000 Ohm-m. This generally indicates zones of some increased weathering/fracturing. Any moderately weathered/fractured rock will be marginally rippable to requiring breaking/blasting if within proposed construction depth. Slightly weathered/fractured to fresh rock will require breaking/blasting.

The locations of the ground investigations are shown in Figures 7-13 and details of each investigation location is presented in the Appendices (Appendix 2-6A – 2-6C).

Proposed GCR works areas and TDR accommodations

Shallow excavations are required for the proposed GCR. The standard trench is 0.6 m wide by 1.25 m deep with horizontal directional drilling (HDD) proposed for the Bonet River crossing. A site walkover was undertaken in January 2025 of the proposed GCR at the River Bonet crossings. Works are required on the proposed TDR, mainly at the TDR entrance road. A site walkover was undertaken in October 2025 of the proposed TDR accommodation areas. No peat was recorded on the works areas of the proposed TDR. The existing environment at proposed GCR and accommodation areas of the proposed TDR were also assessed via review of contour mapping, LiDAR data, GSI soils and subsoils mapping, and historical mapping.

Table 7-7: Ground profile at SI locations

Turbine (Trial Pit No./Borehole No. /Hand Auger No.)	Depth (m)	Ground Profile	Comments
Substation (TP)	0-3.5	CLAY	No peat
Met Mast	0-0.8	Peaty topsoil	Peat probe data indicated 0.4m of peat/soft sediment at the met mast.
Construction Compound (North)	0.4-0.7	Peaty topsoil and PEAT	Peat probe data indicated 0.4 to 0.7m of peat/soft sediment
Construction Compound (South)	0-1.1	Peaty topsoil and PEAT	Peat probe data indicated 0.6 to 1.1m of peat/soft sediment
T1 (GA111)	0.0 – 0.8	CLAY	Light brown, firm, organic CLAY
T2 (TP42)	0.0 – 0.4	PEAT	Peaty Topsoil : slightly gravelly peat with grass rootlets.
	0.4 – 2.2	TOPSOIL	Very soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT with tree stumps
T3 (TP26)	0.0 – 0.4	TOPSOIL	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets
	0.4 – 2.2	PEAT	Very soft dark brown slightly sandy slightly gravelly fibrous PEAT with tree stumps
T4 (TP24)	0.0 – 0.2	TOPSOIL	Soft dark brown slightly sandy slightly gravelly Peaty TOPSOIL with grass and rootlets
	0.2 – 1.0	PEAT	Soft dark brown slightly sandy slightly gravelly fibrous PEAT with tree stumps
	1.0 – 1.2	GRAVEL	Grey slightly sandy angular to subangular fine to coarse GRAVEL of Slate
T5 (TP20)	0.0 – 0.2	TOPSOIL	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets

Turbine (Trial Pit No./Borehole No. /Hand Auger No.)	Depth (m)	Ground Profile	Comments
	0.2 – 0.6	PEAT	Soft dark brown slightly sandy slightly gravelly slightly clayey fibrous PEAT
	0.6 – 1.2	CLAY	Soft to Firm brownish grey slightly sandy slightly gravelly silty CLAY with occasional angular to subangular cobbles
T6 (TP45)	0.0–0.05	TOPSOIL	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets
	0.05–0.5	CLAY	Soft brown sandy gravelly slightly silty CLAY with occasional angular to subangular cobbles and boulders
T7 (BH1)	0.00–2.5	FILL	Driller notes road fill. Recovery consists of Fill: Light brown angular to subrounded medium to coarse Gravel with cobbles and boulders of Sandstone
	2.5–3.4	SANDSTONE	Strong thickly laminated to thinly bedded grey mottled orange fine to medium grained SANDSTONE with some clay banding. Distinctly weathered to residual. 2.50m - 3.40m BGL: Non-Intact Zone with Clay bands
	3.4 – 5.5	SANDSTONE	Strong to very strong thickly laminated to thinly bedded brown mottled grey medium to coarse-grained SANDSTONE with some orange surface staining and slight clay banding. Unweathered to partially weathered. 3.50m - 3.55m BGL: Clay band. 3.65m - 3.68m BGL: Clay band
T8 (TP17)	0.0–0.3	TOPSOIL	Soft dark brown slightly sandy slightly gravelly Peat TOPSOIL with grass and rootlets
	0.3–0.7	PEAT	Soft dark brown slightly sandy slightly gravelly pseudo fibrous PEAT
	0.7 – 1.6	CLAY	Firm bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles

Turbine (Trial Pit No./Borehole No. /Hand Auger No.)	Depth (m)	Ground Profile	Comments
	1.6 – 3.5	CLAY	Stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders
T9	0.0 – 0.1	TOPSOIL	TOPSOIL - Dark brown slightly sandy slightly gravelly Clay with grass and rootlets.
	0.1 – 0.8	CLAY	Stiff grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders
T10 (GA106)	0.0 – 0.1	TOPSOIL	TOPSOIL -Brown slightly sandy slightly gravelly Clay with grass and rootlets.
	0.1-1.6	PEAT	Spongy dark greyish brown pseudo-fibrous PEAT with fine roots (0.5-2.0mm)
T11 (GA7)	0.0 – 0.1	TOPSOIL	TOPSOIL- Dark brown slightly sandy slightly gravelly Clay with grass and rootlets.
	0.1-0.7	CLAY	Firm becoming stiff light brown slightly sandy organic CLAY. Sand is fine to coarse
T12 (GA114)	0.0 – 0.1	TOPSOIL	TOPSOIL-Brown slightly sandy slightly gravelly Clay with grass and rootlets.
	0.1 – 0.5	CLAY	Stiff grey very sandy CLAY. Sand is fine to coarse.
T13 (GA119)	0.0 – 0.1	TOPSOIL	TOPSOIL - Dark brown slightly sandy slightly gravelly Clay with grass and rootlets.
	0.1 – 2.0	CLAY	Stiff dark brown CLAY.
T14 (GA117)	0.0 – 0.1	TOPSOIL	TOPSOIL - Brown slightly sandy slightly gravelly Clay with grass and rootlets.
	0.0 – 0.4	CLAY	Stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse.

Borrow Pits

Three borrow pit areas have been identified within the development footprint, borrow pit 1 located west of Turbine 1, borrow pit 2 located to the south of Turbine 8, and borrow pit 3 southwest of Turbine 13. These locations were selected based on geological mapping and site investigations with areas of shallow bedrock, or suitable material. The borrow pit selection was based on the following factors:

- Avoidance of peat based on site walkovers;
- Avoidance of regional important aquifer; and
- Avoidance of potential ecological/ornithological receptors.

Based on peat probe data and site observations, rock is shallow at BP1. Geological mapping and data from the GSI suggest that the underlying bedrock comprise of Medium grained sandstone and shale.

BP2 is the largest of the borrow pits on site. BH1 was completed in close proximity to the proposed BP2. Geological mapping and data from the GSI suggest that the underlying bedrock is of similar composition to our site boreholes. Medium grained SANDSTONE was observed from 2.5 mbgl in close proximity to the central borrow pit location. Laboratory testing on the recovered core samples indicates that the material is suitable for reuse in construction, particularly in hardstand areas and along access roads. Groundwater levels are >8 m below ground level at BP2.

BP3 is located to the south of the wind farm site. BH5 and BH6 was completed at the proposed BP3. Geological mapping and data from the GSI suggest that the underlying bedrock is of similar composition to our site boreholes. Weathered sandstone bedrock and thinly to medium bedded SANDSTONE, interbedded with dark grey fine grained thinly bedded SILTSTONE. Bedrock in BP3 varies from 2.3 mbgl (BH5) to 8.8 mbgl in BH6. Depth to bedrock increases to 8.8 mbgl the south based on BH6. Laboratory testing on the recovered core samples indicates that the material is suitable for reuse in construction, particularly in hardstand areas and along access roads. Winter groundwater levels were 5.7 mbgl on the 20th November 2025 following a period of high rainfall.

The overlying peat cover at the central borrow pit (BP2) site is shallow (<1m), and its removal is expected to have minimal environmental impact. Overall, the borrow pits are deemed viable sources of suitable aggregate for on-site construction needs.

Table 7-8: *Borrow Pit - Potential Material Volumes and Summary of the Area Characteristics*

Borrow Pit Ref No.	Material Type	Depth minus Overburden	Potential Volume (m^3)[10]	Ecological/Other Constraints
BP1	Class1/2 soils, Sandstone bedrock	(3 m – 1 m) 2 m of available material	21,600 m^3 Overburden 13,500 m^3	No significant constraints, average 0.5 m peat/soft sediment encountered
BP2	Sandstone bedrock	(8 m – 1.5 m) 6.5 m of available material	174,720 m^3 Overburden 50,400 m^3	No significant constraints, average <0.5m peat / soft sediment encountered
BP3	Class1/2, Sandstone bedrock	(6 m – 1.5 m) 4.5 m of available material	51,847 m^3 Overburden 21,603 m^3	No significant constraints, no peat encountered

7.3.2.1 Receptor Sensitivity

Section 7.2 presents the sensitivity criteria of the receiving land, soils and geology environment in terms of the proposed project and identifies those receptors which will be carried forward into the assessment. As detailed in Section 7.2, potentially sensitive receptors comprise the following:

- Land use (including agricultural land and forestry);
- Soils (including peat soils and mineral soils);
- Aggregate reserves (areas with known or potential crushed rock or granular aggregate resources;
- Geological heritage sites (including County Geological Sites and other designated or regionally important geological features;
- Geohazards (specifically karst features and peat stability).

Important receptors in terms of sensitivity and potential for significant effects are the karst features and peat stability (due to their susceptibility to disturbance and potential for ground instability) and the Geoheritage site at Dough Mountain, which is a designated geological heritage features.

The sensitivity of the existing subsoils and geology within the proposed wind farm site, GCR works areas and TDR accommodations were assessed as not economically important and do not have other geological or geomorphological attributes that are of significance on a national scale. The soils present within the proposed wind farm site, GCR works areas and TDR accommodation areas are classified as being of low to medium sensitivity on a local scale. Peat

[10] Conservatively assumes 90% usage for bedrock

within the footprint was previously drained for forestry, agricultural activity and turbary use. As a consequence, peat is not active i.e. not a carbon sink.

Peat has been identified at the proposed wind farm site in areas; however, it will be managed, where required, through the implementation of geotechnical mitigation techniques, such that residual peat-related risks are negligible. The geohazards are therefore of low sensitivity based on the Peat Stability Risk Assessment (PSRA). The geotechnical mitigation techniques which may be incorporated include barriers/supports between excavations and any potentially unstable peat (e.g. granular berm or sheet piles), with long-term stability ensured by backfilling around turbine foundations to existing ground level following construction. This is discussed further in Section 7.4 below.

Karst features were avoided and have not been recorded within the turbine layout and will be actively avoided such that residual karst-related risks are negligible. The geological hazards are therefore of low sensitivity. No contaminated land was identified on the proposed wind farm site, and it is therefore not considered a sensitive receptor.

The baseline assessment identifies that there are no active quarries or aggregate extraction sites within the proposed wind farm site boundary. The nearby quarries and aggregate resource areas are therefore of low sensitivity.

The Dough Mountain geological heritage site is of scientific and educational importance and is therefore classified as a high-sensitivity receptor in this assessment. The proposed wind farm intersects only a small peripheral portion of the heritage site and does not require removal or alteration of key geological features or exposures. The overall integrity, visibility and interpretative value of the site will therefore be maintained. With the implementation of standard good-practice construction measures, discussed below, the magnitude of impact on the Dough Mountain geological heritage receptor is assessed as low.

7.4 Assessment of Effects

The effects of the proposed project on Land, Soils and Geology are discussed and assessed in the following sections. The 'do-nothing' scenario is reviewed, 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.

Section 7.3.1.9 above presents the sensitivity criteria of the receiving land, soils and geology environment in terms of the proposed project and identifies those receptors which will be carried forward into the assessment. Potentially sensitive receptors comprise of the following:

- Land use (including agricultural land and forestry);
- Soils (including peat soils and mineral soils);
- Aggregate reserves (areas with known or potential crushed rock or granular aggregate resources;
- Geological heritage sites (including County Geological Sites and other designated or regionally important geological features;
- Geohazards (specifically karst features and peat stability).

The proposed wind farm site is not a sensitive site in terms of the soils and geological environment.

7.4.1 Future Baseline Environment

Proposed wind farm site

The future baseline is set out in this section, while the interaction between the proposed project and other plans or projects is assessed in Section 7.7 (Cumulative Effects).

In order to inform the assessment of the future baseline, a review was undertaken of the current county development plans (Leitrim County Development Plan 2023-2029, Common Agricultural Policy 2023-2027, Forestry Programme 2023-2027 and the National Development Plan 2021-2030). The National Development Plan 2021-2030 and the Forestry Programme 2023-2027 outline the policy for and investment to increase forestry cover. Investment is being provided to support the objectives of the National Biodiversity Action Plan 2023-2030, including measures to combat the spread of invasive alien species, implement Local Biodiversity Action Plans and invest in Agri-environment schemes such as Acres.

Within the proposed wind farm site, forestry management, including thinning, felling, extraction and replanting, and agricultural management would be expected to continue in a manner similar to the current activity. Turf cutting is likely to continue on private lands outside of the proposed wind farm site in the short to medium term. Existing agricultural areas would continue to operate as agricultural land use with similar agricultural output and continual drainage depending on local circumstances.

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

Proposed GCR works areas and TDR accommodations

Road and road verge maintenance will continue as per current practice. Agricultural activity (along the proposed GCR will be maintained in accordance with current management in the short to medium term).

7.2.1 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 (see section 7.5.1) that has been incorporated into the design (e.g. avoiding sensitive features through the siting of the proposed project during the scoping and initial assessment).

Measures have been proposed in Section 7-5 to reduce or mitigate the effects, and the residual effects after the application of mitigation measures are reported in Section 7-6. Measures included in the Construction Environmental Management Plan (CEMP) such as bunding were accounted for as part of this assessment.

The proposed project is characterised by the following civil engineering works to provide the necessary infrastructure as described in Chapter 2 - Description of the Proposed Project:

- Construction of access tracks (permanent and temporary) to the wind turbines, construction compound, met mast and substation;
- Construction of temporary compounds including hardstands, construction material storage areas and site offices;
- Management of excavated materials including peat;
- Excavation for turbine foundations, hardstanding foundations, substation foundations and met masts;
- Excavation of borrow pits, processing of materials and reinstatement;
- Excavation for cable ducts (both onsite and for the grid connection); and
- Construction of surface water drainage systems along the new internal access tracks.

The direct and indirect effects of the construction activities, and their expected duration are discussed further in the following sections. The effect on use of land and on natural resources required to carry out the works which relate to soils and geology is also discussed.

7.4.1.1 Effects on Land Use

Proposed wind farm site

There will be a change in land use associated with the proposed project. A total of 49.0 ha will be utilised for the construction phase on the proposed wind farm site, with 39.3 ha utilised for the operational phase. The main impact of the proposed project with regard to land use is the removal of topsoil, peat and vegetation (including forestry) along with some agricultural land. Calculated volumes of peaty podzol soils and peat to be excavated are 101,911 m^3. There is no loss of peat or subsoil, as it will all be permanently relocated within the proposed wind farm site to the borrow pits.

Agricultural Land

The sensitivity of agricultural land is low, as it lacks regional economic importance or unique geological attributes. The magnitude is low adverse due to the limited permanent footprint and reuse of excavated materials onsite. The effect is therefore not significant, negative, certain, and long-term.

Forestry

Forested areas cleared for construction (e.g., borrow pits) represent a temporary impact only. These areas will be reforested post-construction, returning to forestry use. With low sensitivity and imperceptible magnitude (fully reversible), the effect on forestry is not significant, neutral, certain, and short-term.

Peat

Peat and peaty podzols will be excavated but permanently relocated to onsite borrow pits. This represents a permanent land use change from peatland to infrastructure/landscape areas, but with no net loss of material. Sensitivity is low (cutover peat) and magnitude low adverse (relocated onsite). Effect: not significant, negative, certain, long-term.

The land uses in the proposed wind farm site do not have other geological attributes that are of significance. The land uses in the proposed wind farm site are not economically important on a regional scale that are of significance. Hence, the importance/sensitivity of the geological environment is considered to be low. The sensitivity of the forestry/agricultural lands is low and the magnitude is low adverse. Therefore, the effect of the proposed project with regard to land use change, is considered not significant, negative, certain and long-term.

There are no significant indirect effects anticipated on land use as a result of the proposed project.

Proposed GCR works areas and TDR accommodations

The proposed GCR is predominantly in the existing road corridor. The GCR land use is mainly local roads (L2169, L4165 and L8269) with a small section off road agricultural land for the HDD crossings at the Bonet River. For a short section near the River Bonet GCR crossing, there will be permanent change of land use from agriculture to electricity transmission.

The land use for the proposed GCR is therefore classified as a low sensitivity receptor as they are predominantly within the road network and via HDD. The effects of land use in the proposed GCR are localised, and do not have geological or geomorphological attributes that are of significance. Hence, the importance/sensitivity of the geological environment is considered to be low. The magnitude of effect is assessed as low adverse due to the limited footprint and temporary effects. Therefore, given the low sensitivity and the low adverse magnitude rating, the effect on land use due to the construction of the GCR is considered not significant, negative, certain, and temporary.

Due to the land use receptors affected by the TDR accommodation areas, which comprise roadside agricultural verges and minor areas of low sensitivity, which lack regional economic importance, geological value, or protected status. Coupled with the limited footprint and temporary duration of TDR accommodations (soil stripping with full reinstatement), the magnitude of effect is assessed as negligible. Low sensitivity combined with negligible magnitude results in an imperceptible, negative, temporary effect from TDR land use change. TDR accommodations will be contained within the existing road corridor, maintaining current land use allocations, their magnitude is negligible and effect not significant.

7.4.1.2 Effects on Contaminated Sites/Potential for Contamination

Contaminated sites

Proposed wind farm site

No contaminated sites were identified in the study area of the proposed wind farm site. Pre-mitigation likely significant effects on previously contaminated sites are therefore considered to be imperceptible.

Proposed GCR works areas and TDR accommodations

An evaluation was undertaken to determine the presence and extent of potentially contaminated land along the proposed GCR and accommodation areas on the proposed TDR. No contaminated sites were identified. Due to the limited area of soil disturbance on the off-road sections, the magnitude is negligible.

The sensitivity of the soils and subsoils is low due to the absence of known contamination sources and the geological characteristics, and the magnitude is negligible. Pre-mitigation, Likely significant effects relating to contaminated sites along the proposed GCR and accommodation areas on the proposed TDR are considered imperceptible.

Potential for contamination

Construction machinery and equipment contain various vehicle fluids/ oils and fuels (hydrocarbons) which have the potential to contaminate the wind farm site 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.

Proposed wind farm site

Potential leaks or spills from construction activities within the proposed wind farm have the potential to pollute the soils and geology environment. Due to the presence of shallow bedrock and greenfield soils the sensitivity is medium. The sensitivity of the soils and subsoils is medium, and the magnitude is low adverse.

Wherever there are vehicles and plant in use, there is the potential for hydrocarbon release which may contaminate the soil and subsoil. Any spills and leaks to ground will be contained locally based on the project design and will be attenuated in the subsurface environment by mixing/dilution, sorption/desorption and degradation. Spill prevention and response measures (secondary containment, drip trays, supervised refuelling, impermeable refuelling zones), will reduce the likelihood and impact of accidental spills to ground and are discussed in more detail in Chapter 8, Hydrology and Hydrogeology.

Likely significant 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.

Proposed GCR works areas and TDR accommodations

The potential for soil contamination is minor on a local scale. The sensitivity is low and the magnitude is medium adverse. A spill of fuel or oil would therefore potentially present a slight/not significant direct, short-term, adverse effect on soil and subsoils along the proposed GCR and accommodation areas on the proposed TDR route.

7.4.1.3 Effects on Mineral/Aggregate Resources

Proposed wind farm site

The main effect of the proposed project with regard to mineral/aggregate resources is the removal of topsoil and excavation of the borrow pits. The borrow pits have the capacity to provide up to 248,167 m^3 of material, as per the Spoil & Peat Management Plan, Appendix 2-5).

Excavated (non-peat) soils will be either reused locally alongside the proposed access tracks on site, reinstate the borrow pits or in landscaping. Any soil placed adjacent to the proposed access tracks will be restricted to use for drainage and contouring immediately adjacent to both sides of the tracks (rather than stockpiling).

Excavated peat will be placed in the borrow pit areas. Peat will be stockpiled no higher than 1.0 m and follow the recommendations set out in the NRA Guidelines for the Management of Waste from National Road Construction Projects (NRA, 2017) and Guidance on Developments on Peatland (Scottish Government, 2014). A Spoil and Peat Management Plan is included in Appendix 2-5.

The potential extraction of mineral/aggregate resources within the project area is limited and localised, resulting in a low magnitude of impact. The effects on mineral / aggregate resources within the proposed wind farm site are considered a receptor of low sensitivity.

While borrow pits will be utilised for material excavation, the overall loss of mineral resources is minimal and confined to these specific locations within the site. The sensitivity of affected aggregate resources is low, as they comprise unproven local deposits of limited regional economic importance. The magnitude of effect is low adverse due to the confined footprint and relocation of excavated material within the proposed wind farm site. Pre-mitigation, there is anticipated to be a not significant, negative, certain, permanent effect on mineral and aggregate resources.

Where excavations extend into competent rock, they are likely to require rock breaking and potential ripping to extract the stronger rock. Rock breaking will be required for the majority of the time in all borrow pits. The depth of competent rock varies across each borrow pit. The noise and vibration effects of this method of extraction are addressed in Chapter 9 - Noise and Vibration.

Proposed GCR works areas and TDR accommodations

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

Carbon Loss

As outlined above in Section 7.2.1, peat is present within the proposed wind farm site. Excavation of peat across the proposed wind farm site is anticipated. The excavation of in-situ

peat will lead to carbon release, and to the loss of potential carbon storage, due to depletion of the peat bog carbon sink. This has been further assessed in Chapter 12 - Climate.

7.4.1.4 Effects on Soil Compaction and Erosion

Proposed wind farm site

Compaction and or erosion of soils can occur on construction sites. Excavated material will arise from all infrastructure elements of the proposed wind farm (bases, access tracks, hardstanding etc.). Table 7-9 provides a summary of the excavation volumes necessary for infrastructure.

Table 7-9: Excavated Material Volumes

Area	Volume (m^3)
Hardstanding Foundations	67,672
Turbine Foundations	25,760
Substation	4,645
Access Tracks	22,531
Temporary Compounds	10,511
Total	120,608

According to the data collected during the onsite geotechnical investigation works completed between October 2020 and November 2025, the overburden material generally consists of shallow peaty soils underlain by stiff bluish grey slightly sandy gravelly silty CLAY with occasional angular to subangular cobbles and boulders. The soft peat conditions require removal 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 gravity 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.

Access tracks will be needed to accommodate the construction works and provide access to turbine locations for the life cycle of the proposed project. The access tracks will be constructed using borrow pit material as subbase and unbound crushed aggregates and they will incorporate drainage to maintain the performance of the pavement during wet weather. All access tracks will be constructed as founded roads. Founded roads are excavated down to and constructed up from a competent geological stratum, whereas floated roads are built directly on top of the peat and soft soils. The founded roads shall be constructed to average heights of 0.2 m above existing ground level. The access roads/tracks will be of founded construction. This will minimise the amount of excavation required for the access roads. Refer to Planning Drawing 10955-2033 for road construction details.

Surfacing material will be imported from locally approved commercial quarries, where required. Most of the material required for the project will be sourced from the borrow pits located within or near the site. This approach significantly reduces the need to transport materials over long distances, thereby alleviating pressure on local transport routes and proposed internal roads.

This reduction of site traffic will help reduce soil compaction and erosion. However, the importing of material from external quarries will place additional pressure on transport routes, as discussed in Chapter 16 - Traffic and Transport.

The construction of temporary and permanent roads will generate construction traffic that has potential to cause soil compaction and erosion along working areas. These receptors are of low sensitivity, and the magnitude is low due to limited duration, traffic management and confined working widths. Overall, the construction of the temporary and permanent roads presents a slight, permanent, negative effect.

Proposed GCR works areas and TDR accommodations

The potential sensitivity of soil compaction and erosion is low and on a local scale for the GCR and accommodation areas on the proposed TDR. The receptors for soil compaction and erosion along the GCR works areas and TDR accommodations are roadside verge soils and minor off-road agricultural soils, which are of low sensitivity due to their disturbed nature and lack of regional agricultural importance.

There are limited off-road areas along the proposed GCR and accommodation areas on the proposed TDR. No peat was encountered on the GCR or TDR. The sensitivity is low and the magnitude is low adverse. Pre-mitigation potential effects on soil compaction and erosion along the proposed GCR and the accommodation areas on the proposed TDR are not significant, short term and reversible.

7.4.1.5 Effects on Geohazards – Karst, Peat and Soil Stability

Proposed wind farm site

A Peat Stability Risk Assessment (PSRA) has been undertaken for the proposed project by Ciaran Reilly and Associates. The PSRA is included in Appendix 7-1.

The stability analysis was completed with characteristic loads and soil strength parameters. The calculated over-design factor (ODF) must be greater than or equal to 1.0 for the design. The findings of the peat stability assessment showed that the proposed wind farm site has an acceptable ODF (1 or greater), is suitable for the proposed project development and is considered to be at low risk of peat failure. The sensitivity is considered high due to the presence of peat on the wind farm site. Due to the limited depth of peat and the PSRA results, the magnitude is low adverse. Potential effects are considered, slight, (not significant) long term, negative, direct and indirect with very low probability.

Details of the karst identified on the wind farm site are included in Chapter 8 - Hydrology and hydrogeology. Due to the avoidance of known karst features, the magnitude is low adverse. Potential effects are considered, slight, long term, negative, direct and indirect with very low probability.

Proposed GCR works areas and TDR accommodations

No peat or karst was identified on the proposed GCR or accommodation areas on the proposed TDR study area. Therefore, there are no direct or indirect potential effects anticipated on areas of peat or karst.

7.4.1.6 Effects on Geological Heritage Sites

Proposed wind farm site

The eastern section of the proposed wind farm site is within the Dough Mountain Geological Heritage Site (Site Code LM009). Turbines T5, T7, T8, T13 and T14 and borrow pit 2 are located within the mapped extent of Dough Mountain however they occupy less the 1% of the overall Dough Mountain Geological Heritage Site. The potential impact relates to the localised loss of bedrock and/or geomorphological features at turbine bases, hardstands and sections of access track. The magnitude of impact is assessed as low adverse due to the small portion of the designated site being physically affected, with the vast majority of the designated area and its key geological features remaining untouched and fully legible in the landscape. Based on the high sensitivity and low adverse magnitude of impact, there is potential for slight (not significant) direct effects.

A small portion of the eastern extent of the Arroo Mountain Caves (Site Code LM009) GHS overlaps the northwestern site study area boundary. The Arroo Mountain Caves are located 1.8 km from the proposed T3 wind turbine. No direct or indirect effects were identified on the GHS Arroo Mountain Caves as there is no overlap with proposed wind farm.

Several ASSIs are recorded to the north and northeast of the proposed wind farm site within Northern Ireland. These comprise Lough (Melvin ASSI140) (hydrologically connected to the site), Knocknashangan (ASSI297), Ross (ASSI299), Frevagh (ASSI400) and Rushy Hill (ASSI403), which collectively support diverse blanket bog, heathland, purplemoor-grass and rush pasture and aquatic habitats of regional geological and ecological significance comparable to NHAs/pNHAs in the Republic of Ireland. The closest of these mapped sites is approximately 4 km to the northeast of the proposed windfarm site. No direct or indirect effects were identified on the above stated ASSIs as there is no overlap with the proposed wind farm.

Proposed GCR works areas and TDR accommodations

There are no geological heritage sites mapped at works areas on the proposed GCR. The Donegal and Inver Bays (Site Code DL011) GHS is within the proposed TDR. This GHS covers an area between 5 km and 10 km wide, along a coastal strip of almost 40 km, on the northern and eastern side of the bay, and includes hundreds of coastal features. The field stretches as far west as Killybegs, and includes the St. Johns Point peninsula, as well as the areas around Inver, Mountcharles and Donegal Town, and then stretches as far northeast as Lough Eske and the Barnesmore Gap. No potential direct or indirect effects were identified on Geological Heritage Sites along the proposed GCR or on the accommodation areas on the proposed TDR within the road corridor and due to the limited accommodations, which consist of temporary hedge trimming, local road edge strengthening and movement of street furniture.

7.4.2 Likely Significant Effects – Operational Phase

7.4.2.1 Effects on Land Use

Proposed wind farm site

During the operational phase, there will be no land use change. The land use change is assessed during the construction phase. Where the footprint of the proposed infrastructure is not located and the associated felling is not required (i.e. on the vast majority of the proposed wind farm site) there will be no anticipated change in land use as those activities will continue. No

significant land use changes will occur during the operational phase, therefore the sensitivity is low and the magnitude is negligible. Pre-mitigation potential effects on land use at the proposed wind farm site are imperceptible. The works area on the proposed south site entrance will be reinstated at the end of the construction phase, so that the lands will revert to their original land uses of agriculture.

Proposed GCR works areas and TDR accommodations

For the proposed GCR, which is almost entirely located within public road corridors or on private farms or forest tracks, there will be no significant change of land use (i.e. they will still be used for transport), although the land will also be used for electricity transmission. For a short sections near the River Bonet GCR crossings, there will be permanent change of land use from agriculture to electricity transmission. The land use has a low value on a local scale and the sensitivity is low. Due to the limited proportion along the GCR where a change of land use will occur and the magnitude is low adverse, it is anticipated that there will be a not significant effect on land use for the proposed GCR during the operational phase.

The temporary accommodations are located within the road corridor so the transportation land use will generally remain. The land use has a low value on a local scale and the sensitivity is considered low. Due to the limited proportion along the works areas on the proposed TDR where a change of land use will occur, the sensitivity is low and the magnitude is imperceptible adverse. It is therefore anticipated that the effect on land use at the works areas on the proposed TDR will be not significant and positive during the operational phase.

7.4.2.2 Effects on Contaminated Sites/ Potential for Contamination

Proposed wind farm site

Any hydrocarbon or oil spills related to the maintenance of the proposed wind farm (access tracks, substation, turbines, etc.) has the potential to negatively affect the ground directly. 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 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. Potential effects are therefore considered to be not significant, unlikely, short-term and negative due to the limited maintenance requirement and the proposed design standards applied i.e. bunding.

Proposed GCR works areas and TDR accommodations

No works are anticipated on the proposed GCR or accommodation areas on the proposed TDR for the operational phase. Minor excavation of soils, subsoils and bedrock may be required where a grid fault is detected, however based on the reliability of modern cables and length of cable, faults are not anticipated over the lifetime of the proposed project. These works will result in temporary disturbance of road surfaces and cable trenches/joint bays. Any surplus excavated material associated with trenching and access tracks will be removed off-site to a licenced facility. In addition, the cables do not contain hydrocarbons. The sensitivity is low, and the magnitude is low adverse, the pre-mitigation potential effects relating to contamination along

the proposed GCR and accommodation areas on the proposed TDR are considered not significant, unlikely, short term and negative.

7.4.2.3 Effects on Mineral/Aggregate Resources

Proposed wind farm site

It is not anticipated to cause a significant effect on any existing mineral or aggregate resources. In relation to indirect effects, small volumes of additional unbound crushed aggregate material may be required during the operational phase where roads/tracks have settled on the subsoil and to resurface unbound roads. Aggregates required will only be sourced from quarries with planning permission. This will place occasional demand on local stone resources. It is expected that only small quantities of unbound crushed aggregates may be needed. The potential effects on mineral/aggregate resources during operation are considered to be not significant.

There is no proposed extraction during the operational phase. The sensitivity is low, and the magnitude is negligible adverse, the potential effects on mineral and aggregate resources at the proposed wind farm site are therefore considered to be imperceptible and long-term.

Proposed GCR works areas and TDR accommodations

There is no proposed extraction during the operational phase. There are no anticipated operational phase effects associated with mineral/aggregate resources for the proposed GCR and the accommodation areas on the proposed TDR. The sensitivity is low, and the magnitude is negligible adverse, the potential effects on mineral and aggregate resources at the proposed GCR and accommodation areas of the proposed TDR, are therefore considered to be imperceptible and long-term.

7.4.2.4 Effects on Soil Compaction and Erosion

Proposed wind farm site

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

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

Proposed GCR works areas and TDR accommodations

The sensitivity of the soils and subsoils during operation, along the proposed GCR and accommodation areas of the proposed TDR is low and the magnitude is negligible. The potential effects on soils as a result of soil compaction and erosion during operation, related to occasional maintenance vehicle traffic, are considered to be not significant, certain, permanent and negative.

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

7.4.2.5 Effects on Geohazards – Peat, Karst and Soil Stability

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

The PSRA is included in Appendix 7-1. There are no significant operational phase effects associated with geohazards for the proposed project. The operational phase sensitivity is considered high due to the presence of karst features, peaty soils and peat at the wind farm site. While the sensitivity is high, the magnitude is negligible, therefore there is an imperceptible, long-term negative effect for geohazards (peat, karst and soil stability).

Proposed GCR works areas and TDR accommodations

There are no anticipated operational phase effects associated with geohazards for the proposed GCR and the accommodation areas on the proposed TDR.

7.4.2.6 Effects on Geological Heritage Sites

Proposed wind farm site

As detailed in section 7.3, the proposed wind farm is located in the Dough Mountain GHS. The proposed wind farm occupies less than 1% of the Dough Mountain GHS. The eastern section of the proposed wind farm site overlaps with the Dough Mountain Geological Heritage Site (Site Code LM009). There is no potential for additional effects during the operational phase. There are no direct or indirect potential significant effects on GHS's during the operational phase.

Proposed GCR works areas and TDR accommodations

There are no geological heritage sites mapped at works areas on the proposed GCR. The Donegal and Inver Bays (Site Code DL011) GHS is within the proposed TDR. There are no direct or indirect potential significant effects on GHS's during the operational phase.

7.4.3 Likely Significant Effects – Decommissioning

The likely significant effects associated with decommissioning will be similar to those associated with construction but of reduced magnitude because of limited excavation, and wet concrete handling will not be required. Below ground infrastructure including turbine foundations will remain in place during the decommissioning phase.

Turbine foundations and hardstands will remain in place and will 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. The potential effects of the proposed project are summarised below.

The road improvements along the works areas on the proposed TDR will be left in situ, while the proposed GCR will not be decommissioned.

7.4.3.1 Effects on Land Use

Proposed wind farm site

The proposed wind farm site is currently predominantly covered in forestry and agricultural lands. Development of a wind farm and associated infrastructure will result in a change in land use. All hardstand areas will be allowed to naturally re-vegetate following the decommissioning phase. The sensitivity on the wind farm site is low and the magnitude is low adverse. Therefore, the effect of the proposed project with regard to land use change, is considered not significant, negative, certain and long-term. There are no indirect effects anticipated on land use as a result of the proposed project.

Proposed GCR works areas and TDR accommodations

There are no proposed works on the GCR or the accommodation areas of the proposed TDR during the decommissioning phase.

7.4.3.2 Effects on Contaminated Sites/Potential for Contamination

Proposed wind farm site

Decommissioning machinery and equipment which contain various vehicle fluids/oils and fuel have the potential to contaminate the site through leaks and/or spills. The proposed infrastructure (including turbines, roads, substation and site compounds) will be excavated and moved using excavators, wheeled dumpers, HGVs and bulldozers. Fuel will be required to supply the required machinery, and the fuel will be stored at the decommissioning compounds. Potential leaks or spills from decommissioning activities within the proposed wind farm have the potential to pollute the soils and geology environment. Embedded measures such as bunding and hydrocarbon interceptors will be utilised at the compounds. Please refer to Chapter 8, Hydrology and Hydrogeology, for further information on contamination mitigation measures. The soils and subsoils on site are of low to moderate productivity. The sensitivity of the soils and subsoils is low to medium, and the magnitude is medium adverse. Pre-mitigation potential effects are therefore considered to be slight, localised and short term on the potential for contamination at the proposed wind farm site.

Proposed GCR works areas and TDR accommodations

There are no proposed works on the GCR or the accommodation areas on the proposed TDR during the decommissioning phase.

7.4.3.3 Effects on Mineral/Aggregate Resources

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

7.4.3.4 Effects on Soil Compaction and Erosion

Proposed wind farm site

The potential sensitivity of soils in relation to soil compaction and erosion is low on a local scale. Access tracks will remain in place for decommissioning machinery, which have potential to increase soil compaction and erosion. The sensitivity is low, and the magnitude is low adverse.

The potential effects on soil compaction and erosion are considered to be not significant, certain, permanent and negative.

Proposed GCR works areas and TDR accommodations

The GCR and TDR are not subject to any decommissioning works therefore no significant effects will occur.

7.4.3.5 Effects on Geohazards - Peat and Soil Stability

Proposed wind farm site

Existing foundations and roads will remain in place following decommissioning. Potential effects are considered slight/not significant, long term, negative, direct and indirect, and very low probability.

Proposed GCR works areas and TDR accommodations

There are no proposed works on the proposed GCR or the accommodation areas on the proposed TDR during the decommissioning phase.

7.4.3.6 Effects on Geological Heritage Sites

As detailed in section 7.4.2, part of the wind farm is located in the Dough Mountain GHS. There are no significant direct or indirect potential effects on Geological Heritage Sites during the decommissioning phase.

7.4.4 Summary of Likely Significant Effects

No likely significant effects were identified on land use, contaminated sites/potential for contamination, soil compaction, soil erosion, geohazards or geological heritage sites during the operational or decommissioning phase.

No likely significant effects were identified on land use, contaminated sites, mineral/aggregate resources, or geological heritage sites during the construction phase. Soil compaction/erosion and geohazards were assessed as slight and slight-moderate effects respectively which are not considered likely significant per the adopted EIAR significance matrix.

7.5 MITIGATION MEASURES

Mitigation measures have been proposed in order to avoid or reduce any likely significant effects identified in the preceding section. However, in most instances, the mitigation measures are proposed as best practice but are not required to mitigate likely significant effects. Standard design or embedded measures are included in Section 7.5.1. A Construction Environment Management Plan (CEMP) has been developed and can be viewed in Appendix 2-4.

7.5.1 Embedded Mitigation

The design teams integrated mitigation measures into the project's design (referred to as *embedded mitigation*). These measures are inherent to the project and are outlined in Chapters 2 – Description of the Proposed Project. Embedded mitigation measures have been incorporated into the design of the proposed wind farm and are therefore considered an inherent part of the project rather than additional, stand-alone mitigation. However, for transparency and to demonstrate how these measures will function in practice, the relevant embedded measures are also summarised in the mitigation section and table below, alongside any further mitigation that may be required to address residual effects. This approach is intended to clearly show how environmental considerations have informed the project design, while still illustrating the combined effect of embedded and additional mitigation on the likely effects. These embedded mitigation measures, outlined below, are inherent to the proposed project, and include the following:

- Spoil and Peat Management Plan (Appendix 2-5) to ensure proper handling, storage, and reuse of soils;
- Hazardous substances (fuel, oils, chemicals) will be stored in bunded areas (110% capacity) with impermeable bases;
- Trenchless techniques will be used at major watercourse and infrastructure crossings to minimize disturbance;
- Hydrocarbon interceptors will be installed at construction compounds and substation;
- Topsoil and subsoil will be stored separately (max. 3 m height), protected from contamination, and handled in dry conditions;
- Site operatives will be trained in fuel and oil handling, with spill-response materials maintained on site;
- Welfare facility effluents will be collected in holding tanks for off-site transport to an approved treatment facility;
- The identification and avoidance of potential karst features was undertaken for project design. Turbines, borrow pits, construction compounds and the substation infrastructure is not located within 30 m of any known karst features (dolines etc) or 100 m of swallow holes. The 30 m and 100 m setbacks from karst features and swallow holes are intended to protect groundwater quality and stability by preventing construction-related runoff and contaminants from entering direct, highly permeable pathways to the aquifer. These distances provide a conservative buffer zone around the most sensitive features and are considered sufficient to ensure that the project does not materially increase the risk of pollution or geohazards associated with karst terrain.

Electrical apparatus, such as transformers, will be required within the proposed substation. All oil containing electrical apparatus will be placed within permanent concrete bunds that will have

been constructed and tested to provide containment. Each bund will be sized to hold 110% of the oil volume within the respective electrical apparatus enclosed.

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 a holding tank prior to removal to an approved treatment facility.

The construction compounds 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.

All wastes generated on site will be segregated and appropriate materials are re-used on site. Residual materials will be collected by licensed waste hauliers for appropriate sorting, recycling and disposal.

7.5.2 Construction Phase

7.5.2.1 Mitigation - Land-Use

Based on the pre-mitigation level of effect (not significant), additional mitigation is not required. Nonetheless, the following measures will be implemented in line with best practice:

- Vegetation clearance will be kept to a minimum.
- The proposed construction work areas will be demarcated prior to the construction works commencing.
- No clearance of vegetation will be undertaken outside of the demarcated areas.
- Construction vehicles will be restricted to designated areas and access tracks in order to avoid impacting adjacent habitats and to ensure that soil compaction is restricted to these areas.

All disturbed ground outside of the permanent footprint will be fully reinstated following the completion of the works.

7.5.2.2 Mitigation - Contaminated Sites/Potential for contamination

Based on the pre-mitigation level of effect (not significant), additional mitigation is not required. However, the following measures will be implemented in terms of concrete/cement management, in line with best practice:

- 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; Contractors will be required to provide a designated bin for washing down the chutes of concrete lorries on site;
- Waste material will be removed from site to an appropriate waste permit facility; and
- Disposal of excess concrete on any part of the construction site will be prohibited.

7.5.2.3 Mitigation - Mineral/Aggregate Resources

Based on the predicted level of effect identified in Section 7.4 (Not significant), additional mitigation is not required.

7.5.2.4 Mitigation - Soil compaction and erosion

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

- 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 2-5. Based on the volume calculations, there will be sufficient capacity in the borrow pits to accommodate excavated material. 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.

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 will be brought to a recycling facility for processing in accordance with the circular economy approach.

7.5.2.5 Mitigation - Geohazard/Peat and Soil Stability

Peat or peaty soils on the proposed wind farm are generally relatively shallow, where encountered (ranging from 0.1m to 4.5 m, average 0.7m). 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, any excavated peat will be used to backfill the extant borrow pit areas. A Spoil and Peat Management Plan is provided in Appendix 2-5. A full material management plan for the various phases of the development will be designed and maintained over the course of the project.

Peat, overburden, and rock will be reused on site to reinstate borrow pits and other excavations. Peat soils, where encountered, will be placed in the borrow pit deposition areas, completely below the existing ground profile on all sides thereby containing the peat/peaty soils and eliminating any possibility of a peat stability-related slope failure. The borrow pit deposition areas provide an opportunity for landscaping and restoration to match the natural surroundings.

On completion, the borrow pit deposition area surfaces will be stabilised by the establishment of natural vegetation. The detailed design, construction, and operation and maintenance of the

borrow pit backfill operation will be documented in the detailed, design stage Peat Stability Risk Assessment, the Peat Stability Risk Register, and the Site Geotechnical Folder which is to be handed over for operation and maintenance.

A key project goal is to incorporate sustainability into the design and construction of the project where practical. Where mineral soils are encountered in the excavation and construction of site roads, bases, etc, this material will be stockpiled for assessment and subsequent re-use. Where mineral soil is not directly suitable for construction it will be used for reinstatement works and will be geo-engineered as necessary

Mitigation measures comprise stepping or battering back of excavations to a safe angle to support the peat and soft clays during construction. To ensure slope stability, excavations will be battered back (sloped) to between 1:1.5 and 1:2 depending on the depth and type of material. Permanent slopes will be less than 1:3. The works programme for the construction stage of the proposed project will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. Works will be suspended if the forecast / weather monitoring suggests any of the following is likely to occur:

- >10 mm/hr rainfall (i.e., high intensity local rainfall events);
- >25 mm rainfall in a 24-hour period (heavy frontal rainfall lasting most of the day); or
- >Half the monthly average rainfall in any 7 days.

Prior to works being suspended the following control measures will be completed:

- All open excavations will be secured;
- Temporary or emergency drainage will be provided to prevent back-up of surface runoff; and
- Work during heavy rainfall and for up to 24 hours after heavy rainfall events will be suspended to ensure that drainage systems are not overloaded.

Following mitigation, the hazard ranking of the development is considered to be “low” for all areas. It is concluded that the proposed wind farm site, accommodation areas on the proposed 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 (Appendix 7-1) indicate a *“low”* to *“negligible”* hazard ranking for instability related to the requirement for excavations on the proposed project subject to appropriate mitigation measures.

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 at localised areas and the potentially unstable material at unstable conditions, in the form of 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.

Proposed GCR works areas and TDR accommodations

Based on the predicted level of effect (not significant), additional mitigation is not required. It is concluded that the proposed accommodation areas on the proposed TDR and proposed GCR is suitable for the proposed project.

7.5.2.5.1 Monitoring

The installation of movement monitoring posts will be completed, as per best practice, for areas where works are taking place on or adjacent to identified peat depths greater than 2m.

Movement monitoring posts shall be installed upslope and downslope of the works areas and shall be as outlined:

- Posts shall be 1m to 1.5m in length, installed at 5m intervals with no less than seven posts in each line of sight (~30m).
- A string line shall be attached to the first and last post with all intermediate posts in contact with one side of the string line,
- A numbering system shall be designed for the monitoring posts and a record shall be kept of this numbering system.

Movement monitoring posts shall be observed at least once a day with more frequent inspections when adjacent works are ongoing. Should movements be recorded the frequency of these inspections will be increased. Records shall be kept of all monitoring post inspections with reference to date, time and any relative movement between posts, if any. Any movement identified in the posts shall be recorded with reference to the post numbering system.

The contactor shall also develop a routine inspection of all areas surrounding work in peat, not just exclusively on the monitoring posts. These inspections shall include an assessment of ground stability and drainage conditions. These inspections will identify any cracking or deformation on the peat surface, excessive settlement on structures, drain blockages or springs etc.

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.

7.5.2.5.2 Movement or Instability Observed in Monitoring Areas

Where excessive movement has been observed in the installed monitoring, the following measures will be taken;

- All construction activities will be suspended in the area,
- The Contractors Geotechnical Engineer shall carry out an assessment of the peat instability including drainage. The Contractors Geotechnical Engineer shall compile a report outlining the surveys undertaken, the potential cause of the instability, assessment of any increased risk caused by the instability, and the further measures required to manage this risk,
- An increased monitoring regime shall be specified including increase in number of monitoring post lines, decrease on monitoring post spacing and an increase in the frequency of monitoring post observations,
- Should no further movement be detected, construction activities will be recommenced while maintaining the increased monitoring regime,

- Should further excessive movement be detected, the Contractors design and project geotechnical engineer will be informed so that the cause and significance of the movement can be assessed, any required further investigations undertaken, and appropriate design or construction-method adjustments implemented to maintain stability and safety.

7.5.2.5.3 Emergency Response to a Landslide Event

If the scenario of a landslide, bog burst or peat slide is occurring at the proposed wind farm site the following steps shall be carried out by the contractor:

- All site works will be ceased, and all available resources will be used for the management and mitigation of the risks posed by the event;
- The key initial activity will be to prevent displaced materials from reaching any watercourses or sensitive environments. Where required, temporary containment or interception measures (such as check barrages or catch ditches) shall be installed on land or within affected topographic valleys and watercourses to help prevent further movement or runout of disturbed peat or spoil material.

7.5.2.5.4 Check Barrages

Check barrages are permeable granular structures constructed within the path of a landslide to prevent the further downhill or downstream movement of the disturbed material. Typically, these will be constructed of locally generated stone material, often of large sizing. The large material sizing will allow water to pass through the check barrage material, avoiding a build-up in hydrostatic pressure while containing the debris within the slide. Check barrage will typically be a dam structure between 1 and 1.5 m high, with slopes between 1(V):1.5(H) or 2(H), and constructed across the full section of topographic valley and/or water course.

The check barrage is an emergency preventative measure only to restrict or reduce the movement of displaced material downslope and away from a watercourse. Further assessment and reinstatement works will likely be required should a landslide occur, and engagement and reporting of the incident will be required by all parties involved in the project. Should the check barrage no longer be required it may be removed and the area reinstated.

Check barrages will be put in place in the unlikely event of a landslide event. The proposed mitigation measure of check barrages, are only indicative, targeting potential topographic channels but will vary depending on the location and nature of the slide event. The contractors will include an assessment of potential check barrage locations and method for their construction, within the emergency procedures in their associated Method Statement documentation.

7.5.2.5.5 Catch Ditches

Similarly, ditches will be implemented and may also slow or halt runout, although it is preferable that they are cut in non-peat material. Simple earthwork ditches can form a useful low-cost defence. Paired ditches and barrages have been observed to slow peat landslide runout at failure sites.

7.5.2.6 Mitigation - Geological Heritage Sites

No potential significant effects were identified. Therefore, no mitigation is required, however, opportunity exists to enhance access to bedrock exposures or other features in the Dough Mountain GHS, via internal road installations. The following measures proposed for the Dough Mountain GHS include:

- Continued consultation with the GSI including presentation of ground investigation data on request to assist GSI's data source;
- Limiting excavation by only excavating the required footprint;

7.5.3 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.

7.5.3.1 Mitigation - Land Use

As there is no significant land use changes during the operational phase, additional mitigation is not required.

7.5.3.2 Mitigation - Contamination

Based on the predicted level of effect (not significant, unlikely, short-term and negative) due to the limited maintenance requirement and the proposed design standards applied e.g. containment/bunding measures, additional mitigation is not required.

7.5.3.3 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 7.4.2 and therefore no additional mitigation measures are required.

7.5.3.4 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 7.4.3 and therefore no additional mitigation measures are required.

7.5.3.5 Mitigation - Geohazard /Peat and Soil Stability

No significant effects were identified in Section 7.4.3 and therefore no additional mitigation measures are required. The following outlines an overview of the monitoring measures which will be carried out during the operational and maintenance phase in accordance with the PSRA:

- Communication of the baseline peat environment to appropriate site operatives;
- Ongoing monitoring of residual risks and maintenance will be undertaken.

Monitoring will consist of regular inspection of drains to prevent blockages and inspections of all drainage areas after a significant rainfall event.

7.5.3.6 Mitigation - Geological Heritage Sites

No potential significant effects on the Dough Mountain Geological Heritage Site (GHS) are anticipated during the operational phase, as no further ground disturbance or excavation works

will occur. Therefore, no specific mitigation is required. However, opportunities exist to support ongoing geological interest in the area. The following measures are proposed for the Dough Mountain GHS during operation:

- Continued liaison with the Geological Survey Ireland (GSI) on any relevant operational updates or findings;
- Provision of any relevant geological or geotechnical monitoring data to the GSI, if applicable; and
- Maintenance of site access to known geological features for the GSI, where safe and practicable.

7.5.4 Decommissioning Phase

No significant potential 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.

The risks arising from the decommissioning of the proposed project would be less than those for construction. Mitigation measures for decommissioning would conform to those given for construction (Section 7.5.2) and will be fully protective of the environment.

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

7.6 RESIDUAL EFFECTS

The removal of natural soil, subsoils, and rock and replacement 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. Overall, due the relatively low sensitivity of the land, soils and geology conditions locally and the implementation of the mitigation measures above, the residual effects are not significant and neither permanent nor negative as summarised in Tables 7-10 to 7-15.

Table 7-10: Summary of Post-mitigation Residual Effects - Construction Phase

Environmental Attribute	Residual Effects– Construction
Land Use	Temporary long-term loss of soils – not significant, direct effects
Potential for contamination	Slight/not significant, localised, short term
Contaminated sites	Imperceptible, short-term effect
Mineral/Aggregate Resources	Imperceptible, long-term effect
Soil Compaction and erosion	The potential effect on land soils and geology is negative, certain, direct, not significant and long term.
Geohazards/Peat and Soil Stability	No significant direct/indirect effects on karst features. Peat and soft sediments present are assessed via PSRA. Potential effects are long term, negative, slight/ not significant, direct and indirect, very low probability and will be localised to excavations carried out during construction phase.
Geological Heritage Sites	Long term, negative, slight, direct and indirect.

Table 7-11: Summary of Post-mitigation Residual Effects – GCR and TDR - Construction Phase

Environmental Attribute	Residual Effect– Construction
Land Use	Temporary loss of soils – imperceptible, direct, temporary effects
Contaminated sites	Imperceptible, short-term effect
Potential for contamination	Slight/ not significant, localised, short term
Mineral/Aggregate Resources	Imperceptible, long term effect
Soil Compaction and erosion	Not significant, short term.
Geohazards/Peat and Soil Stability	No karst features or peat identified within GCR & TDR accommodation areas. No significant effects.
Geological Heritage Sites	Long term, negative, imperceptible, direct and indirect, very low probability.

Table 7-12: Summary of Post-mitigation Residual Effects - Operational Phase

Environmental Attribute	Residual Effect – Operational
Land Use	Imperceptible, certain, direct and long term.
Contaminated sites	Imperceptible, certain, direct and long term.
Mineral/Aggregate Resources	Imperceptible, certain, direct and long term.
Soil Compaction and erosion	Not significant, certain, permanent and negative.
Geohazards/Peat and Soil Stability	Long term, negative, imperceptible, direct and indirect, very low probability.
Geological heritage sites	Long term, negative, imperceptible, direct and indirect, very low probability.

Table 7-13: Summary of Post-mitigation Residual Effects – GCR and TDR - Operational Phase

Environmental Attribute	Residual Effect – Operational
Land Use	Imperceptible, certain, direct and long term.
Contaminated sites	Imperceptible, short-term effect
Potential for contamination	Imperceptible, certain, direct and long term.
Mineral/Aggregate Resources	No residual effects.
Soil Compaction and erosion	No residual effects.
Geohazards/Peat and Soil Stability	No karst feature, No peat. No residual effects.
Geological heritage sites	Long term, negative, imperceptible, direct and indirect, very low probability.

Table 7-14: Summary of Post-mitigation Residual Effects - Decommissioning Phase

Environmental Attribute	Residual Effect –Decommissioning
Land Use	Imperceptible, certain, direct and long term.
Potential for contamination	Not significant, certain, direct and long term.
Contaminated sites	Imperceptible, short-term effect
Mineral/Aggregate Resources	Imperceptible, certain, direct and long term.
Soil Compaction and erosion	Imperceptible, certain, direct and long term.
Geohazards/Peat and Soil Stability	Long term, negative, imperceptible, very low probability.
Geological heritage sites	Long term, negative, imperceptible, direct and indirect, very

	low probability.

Table 7-15: Summary of Post-Mitigation Residual Effects - GCR and TDR –Decommissioning Phase

Environmental Attribute	Residual Effect –Decommissioning
Land Use	Imperceptible, certain, direct and long term.
Potential for contamination	Not significant, certain, direct and long term.
Contaminated sites	Imperceptible, short-term effect
Mineral/Aggregate Resources	Imperceptible, certain, direct and long term.
Soil Compaction and erosion	Imperceptible, certain, direct and long term.
Geological heritage sites	Long term, negative, imperceptible, direct and indirect, very low probability.
Geohazards/Peat and Soil Stability	Long term, negative, imperceptible, very low probability.

7.7 CUMULATIVE EFFECTS

Cumulative effects of the proposed project with other developments within the study area are presented here in relation to likely significant effects on land, soils and geology. The developments assessed which are listed below in Table 7-16, include the existing and proposed wind energy developments, described in Chapter 1 and are also illustrated in Figure 7-17. A 5 km radius of the proposed wind farm site were reviewed as part of this cumulative assessment. A 5 km radius was selected for the cumulative assessment of land, soils, and geology effects as it represents a conservative Zone of Influence beyond which cumulative interactions are not credible for this topic

The primary potential for cumulative effects will occur during the construction phase of the proposed wind farm, as this is when earthworks and excavations will be undertaken. The potential for cumulative effects during the operational phase of the proposed wind farm will be significantly reduced as there will be no exposed excavations, no use of cementitious materials and fuels/oil will be kept to a minimum and bunded at the site. During the decommissioning phase, the potential cumulative effects are similar to the construction phase, but to a lesser degree with less ground disturbance.

Table 7-16: Local Authority and ACP Planning Applications for Existing / Proposed Wind Energy Developments within Study Area

Planning Ref.	Development Description	Address	Grant Date /Status
04815	Construction of windfarm comprising of 4 No. wind turbines	Carrickeeny Manorhamilton Co. Leitrim	28/07/2005 / Operational
1667	Faughary Wind farm - 3 no. wind turbines 119-metre-high wind turbines	Faughary, Manorhamilton, Co. Leitrim	12/12/2014 / Operational
1593	Additional Turbine (x2) Erection	Tullynamoyle Rd., Killaraga, Co Leitrim	31/08/2015 / Operational
15164	Additional Turbine (x3) Erection	Lackagh & Tullynamoyle, Killarga, Co Leitrim	01/02/2016 / Operational

1881	Construction and Operation of a Meteorological Mast	Tullynamoyle, Killarga, Co. Leitrim	07/08/2018 / Operational
1926	Additional Turbine (x4) Erection	Tullynamoyle, Killarga, Co. Leitrim	28/05/2020 / Operational
2360082	Continued Operation of a Meteorological Mast	Fenagh, Manorhamilton, Co. Leitrim	14/11/2023 / Operational
2157 (ACP Ref. 312895)	Additional Turbine (x4) Erection	Townlands of Tullinloughan, Lackagh, Tullynamoyle and Gowlaun, Co. Leitrim	29/08/2023 / Proposed
2460223	Modifications to a 10-year development plan that was originally approved under An Bord Pleanála Reference PL12.312895	Tullynamoyle Rd., Killaraga, Co Leitrim	29/08/2023 / Proposed

Mitigation measures detailed above in Section 7.5 for the construction, operation and decommissioning phases of the proposed wind farm will ensure the protection of land, soils and geology. For these reasons it is concluded that there will not be a significant cumulative effect associated with proposed or existing activities.

Indirect effects that may arise due to the use of public roads as haul roads to bring materials to site and the effect of the use of imported stone from available local quarries. Due to the proposed utilisation of on-site borrow pits, the volumes of stone required for import from external quarries is considerably reduced, with no significant cumulative effects envisaged. No cumulative effects are envisaged with proposed or existing operational wind farms such as Faughary Wind farm.

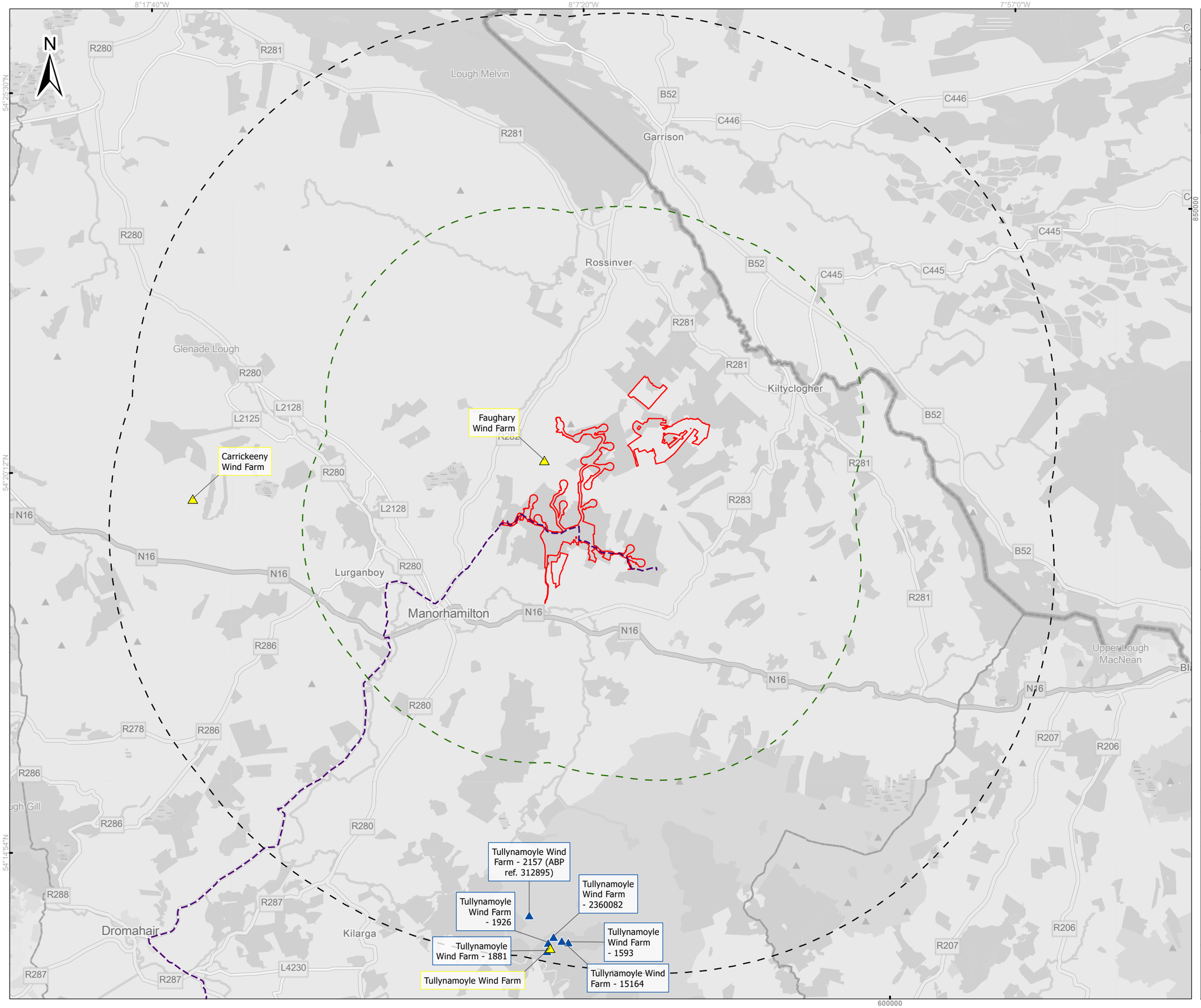
Other

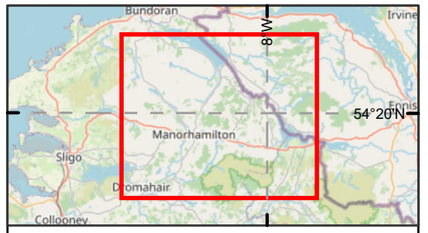
Planning Ref. 20/140 - Permission and Retention Permission for a quarry development at Nure Townland, Lurganboy, Co Leitrim. The application consists of a total area of 3.45 hectares and was granted permission on 20/05/2021. The quarry is located at the boundary of two groundwater bodies the Glencar Limestone Fm. belongs to the Dromahair GWB and the Dartry Limestone Fm. The quarry is located over 4.5 km west of the proposed project, across separate groundwater bodies and geological formations. No likely cumulative land, soils, and geology impacts are anticipated.

Planning Ref. 23/5 – Permission for the filling of lands with imported inert waste consisting of soil & stone material (application area = 1.2 Ha, volume 24,500 tonnes over a period of 10 years), construction of a landscaping berm and all associated ancillary works at Nure Townland, Lurganboy, Co Leitrim. Permission was granted on 23/11/2023. Inert waste infill uses clean soil/stone (no leachate risk) in existing quarry void, presenting no pathway for cumulative soil erosion, contamination, or geohazard effects on the wind farm site.

The remaining applications relate principally to residential, commercial and agricultural use types. Remaining applications present no likely cumulative land, soils, and geology impacts as they involve shallow, stable excavations distant from the wind farm, with no interaction pathways for peat stability, karst, or geological heritage receptors. It should be noted that

details of these applications have been sourced from planning authority datasets available from the Department of Housing, Planning and Local Government and An Bord Pleanála.





Legend

- Application Boundary
- Application Boundary: 5km buffer
- Application Boundary: 10km buffer
- Grid Connection Route

Wind Developments

- Proposed
- Existing

0 2 4
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

Rev	Date	Description	By	Chkd.
A	18/02/2026	First issue	S.P	S.R

Client:
FuturEnergy Ireland

Project:
Lissinagroagh Wind Farm

Title:
Figure 7-17:
Wind Energy Developments

Scale @ A3: 1:90,000

Prepared by: S.Pezzetta
Checked by: S.Ryan
Date: February 2026

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

Map Ref: 10955-060-WFs-P.App.BO-TOB-A

Draft: A

7.7.1 Conclusion on Cumulative Impact Assessment

No significant cumulative effects on land, soils and geology have been identified. No significant cumulative or residual effects were reported for land, soils and geology receptors within any of the nearby wind farms/other developments reviewed. Taking into consideration other plans and projects, no residual cumulative effects are anticipated.

Due to the localised nature of the proposed works within the proposed project boundary, there is no potential for significant, negative cumulative effects in-combination with other local developments on the land, soils and geology environment.

7.8 TRANSBOUNDARY EFFECTS

Due to the localised nature of the proposed construction works which will be kept within the proposed development site boundary, there is no potential for transboundary effects within Northern Ireland.

7.9 CONCLUSION

The assessment of land soils and geology has established a baseline for the receiving environment for the impact assessment. Potential impacts were considered for the construction, operational and decommissioning phases of the proposed project as well as potential residual and cumulative impacts. The proposed wind farm site, GCR and TDR accommodation areas are considered low sensitive locations in terms of land soil and geology and poses a low risk for landslide. The occurrence of karst on the proposed wind farm site is mainly in the form of dolines and three swallow holes. No karst features were identified on the GCR and TDR accommodation areas.

No significant geological resources were identified within the proposed project footprint and there are no anticipated negative impacts to intercepting geological heritage sites within the proposed project. In terms of the soil and geological environment, the effects of the proposed project will be not significant, permanent and negative.

The principal risks associated with land, soil and geology at the proposed project are the management of soils. These risks will be fully mitigated through the implementation of the identified mitigation measures. Hence, it is not expected that the proposed project will give rise to any significant residual or cumulative effects with regard to land, soils and geology.

Overall, the construction of the proposed project will have a not significant negative long-term effect on the soil and geological environment through the application of identified mitigation measures and appropriate management throughout the construction phase of the proposed wind farm. No significant cumulative or transboundary effects on land, soils and geology have been identified.

The operation phase of the proposed project will have a not significant negative long-term effect on the soil and geological environment through the application of identified mitigation measures and appropriate management throughout the operation phase of the wind farm.

The decommissioning phase of the proposed wind farm will have a not significant negative long-term effect on the soil and geological environment through the application of identified mitigation measures and appropriate management throughout the decommissioning phase of

the wind farm. Retention of the access roads as amenity tracks will have a not significant long-term positive effect.

Due to the nature of the peat and subsoils at the proposed wind farm site, construction of the proposed wind farm may require deep excavations at some 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. Following a peat stability assessment, the risk of instability is considered negligible to low following mitigation procedures.

7.10 REFERENCES

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