Environmental Impact Assessment Report

Lemanaghan Wind Farm, Co. Offaly

Chapter 8 Land Soils and Geology

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GLOSSARY OF TERMS

Terms	Definition
Geoheritage	Refers to the 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. Geoheritage can include both in situ elements (geosites) or ex situ elements (collections of geological specimens) with paleontological, geomorphological, mineralogical, petrological or stratigraphical significance, among others.
Geology	The science that deals with the earth's physical structure and substance, its history and the processes that act on it
Hardstanding	Levelled assembly areas comprising of bare soil surface to support plant and machinery
Peat Probing	A method used to measure the depth of peat deposits by pushing specialised, narrow and lightweight rods into the ground until resistance is met.
Piling	Installation of heavy stakes (piles) to support the foundations of the turbine
Morphology	Geological Form or Structure

GLOSSARY OF ACRONYMS

Acronym	Definition
BMEP	Biodiversity Management and Enhancement Plan
CGS	County Geological Site
CO2	Carbon Dioxide
cSAC	Candidate Special Areas of Conservation
EIAR	Environmental Impact Assessment Report
FoS	Factor of Safety
FTC	Fehily Timoney and Company
GSI	Geological Society of Ireland
ha	hectares
HES	Hydro-Environmental Services
IEL	Industrial Emissions Licensing

ITM	Irish Transverse Mercator[1]
IPC	Integrated Pollution Control
NHA	Natural Heritage Area
Nox	Oxides of Nitrogen
OCC	Offaly County Council
PCAS	Peatland Climate Action Scheme
PDA	Peat Deposition Area
PLHRAG	Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments
pNHA	Proposed Natural Heritage Area
PSD	Particle Size Distribution
PSRA	Peat Stability Assessment Report
rEIAR	Remedial Environmental Impact Assessment Report
rNIS	Remedial Natura Impact Statement
SAC	Special Area of Conservation
SNH	Scottish Natural Heritage
SO2	Sulphur Dioxide
SPA	Special Protection Areas
SPT	Standard Penetration Test
TDR	Turbine delivery route

[1] *Coordinate Converter Available here: https://gnss.osi.ie/new-converter/*

8. LAND, SOILS AND GEOLOGY

8.1 Introduction

8.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO, on behalf of Lemanaghan Wind Farm DAC (the Applicant), to carry out an assessment of the potential likely and significant effects of the Proposed Project on the land, soil and geological environment.

The Proposed Project is described in full in Chapter 4 of this Environmental Impact Assessment Report (EIAR). The Proposed Project encompasses the Proposed Wind Farm and the Proposed Grid Connection. The Proposed Project site relates to the primary study area for the EIAR.

This chapter provides a baseline assessment of the environmental setting of the Proposed Project, as described in Chapter 4, in terms of Land, Soils and Geology and discusses the potential likely significant effects that the construction, operation and decommissioning of the Proposed Project will have on the receiving environment. Where required, appropriate mitigation measures to avoid any identified significant effects to Land, Soils and Geology (i.e., natural resources) are recommended and the residual effects of the Proposed Project post-mitigation are assessed.

8.1.2 Statement of Authority

HES are a specialist geological, hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core areas of expertise and experience includes hydrology, soils, subsoils and geology. We routinely complete impact assessments for land, soils and geology, hydrology and hydrogeology for a large variety of project types including wind farms and renewable energy projects.

This chapter of the EIAR was prepared by Michael Gill, Conor McGettigan, and Nitesh Dalal.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland. In addition, he has substantial experience in geological characterisation, peatland morphology, and surface water drainage design and SUDs design and surface water/groundwater interactions. Michael has worked on the EIS/EIAR for Oweninny WF, Cloncreen WF, Croagh WF and over 100 other wind farm related projects across the country.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with 5 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor routinely prepares the land, soils and geology chapters of environmental impact assessment reports for wind farm development. Conor has worked on the EIAR for Ballivor WF, Briskalagh WF, Knockshanvo WF, Seskin WF and over 20 other wind farm related projects across the country.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India. Nitesh holds a M.Sc. in Environmental Science from University College Dublin (2024), a PG Diploma in Health, Safety and

Environment from Annamalai University, India (2021) and B.Tech. in Environmental Engineering (2016) from Guru Gobind Singh Indraprastha University, India (2016).

8.1.3 Scoping and Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as summarised in Section 2.8 of Chapter 2 of the EIAR. Consultation responses relating to the land, soils and geological environment were received from the Geological Survey of Ireland (GSI). Details of the scoping responses and actions taken to address these are outlined in Section 2.8.2 of this EIAR. The responses are summarised in Table 8-1.

Table 8-1 Summary of Scoping Responses.

Consultee	Description	Addressed in Section
Geological Survey of Ireland (GSI)	***Geoheritage*** Our records show that there is a County Geological Site (CGS) adjacent to the proposed wind farm area (Clonmacnoise Esker, Co. Offaly (GR 600870E 730650N)). With the current plan, there are no envisaged impacts on the integrity of current CGS by the proposed development. We ask that any proposed access roads or road upgrades and ancillary works associated with the proposed development do not impact on the esker or wider county geological site as shown on our maps.	Potential effects on the Clonmacnoise Esker CGS are assessed in Section 8.5.2.8.

8.1.4 Relevant Legislation

The EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. Regard has also been taken of the requirements of the following legislation:

- Planning and Development Act, 2000 (as amended);
- Planning and Development Regulations, 2001 (as amended);
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- S.I. No. 296/2018 European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018;
- The Heritage Act 1995, as amended; and,
- European Communities (Environmental Impact Assessment) Regulations 1989 to 2006.

8.1.5 Relevant Guidance

The Land, Soils and Geology chapter of this EIAR is carried out in accordance with the 'EIA Directive' as amended by Directive 2014/52/EU and having regard where relevant to guidance contained in the following documents:

- Environmental Protection Agency (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Institute of Geologists Ireland (2013): Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines for Planning Authorities and An Coimisiún Pleanála on carrying out Environmental Impact Assessment (DoHPLG, 2018); and,
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU), (European Commission 2017).

8.2 Assessment Methodology

8.2.1 Desk Study

A desk study of the Proposed Project site and the surrounding area was completed in early 2021 to collect all relevant geological data. This initial desk study was completed in advance of undertaking site walkover surveys and site investigations. The desk study was checked and updated, where necessary, in April and May 2025. The desk study included consultation with the following data sources:

- Integrated Pollution Control Licence (IPC) Boora Bog Group (Ref: P0500-01) Environmental Protection Agency (Available at EPA Headquarters on request);
- Lemanaghan Bog: Draft Cutaway Bog Draft Rehabilitation Plan 2024 (Appendix 2-4); and
    - Boora Bog Group: Draft Rehabilitation Plan 2018.
- Annual Environmental Reports 2000-2024 (https://www.epa.ie/our-services/licensing/licencesearch/);
- Inspection of production records at Lemanaghan Works;
- Aerial Maps from 1973 to 2020;
- Bord na Móna (BnM) Lidar data;
- Corine Land Cover and Land Cover Change Maps (www.land.copernicus.eu);
- Environmental Protection Agency soils and subsoils mapping (www.epa.ie);
- Geological Survey of Ireland – Geological databases (www.gsi.ie); and,
- Bedrock Geology 1:100,000 Scale Map Series. Geological Survey of Ireland (GSI, 2003).

8.2.2 Baseline Monitoring and Site Investigations

HES completed site inspections and walkover surveys at the Proposed Project site to inform the Proposed Project planning application. These site investigations comprised of peat probing, geological mapping and detailed walkover surveys completed by HES on 8th July 2021, 1st and 7th August 2024 and 17th April 2025. These site investigations and surveys were completed by Michael Gill, Conor McGettigan and Nitesh Dalal (please refer to Section 8.1.2 for qualifications and experience).

Several additional site investigations have been completed at the Proposed Project site to further inform the design and this EIAR. These site investigations included peat probing investigations completed by MKO on 24th September and 31st October 2024, and 5th February 2025. Fehily Timoney and Company (FTC) completed walkover surveys and peat probing investigations at the Proposed Project site on 7th September 2022. The peat probing investigations were undertaken to determine the residual peat depths and to characterise the spatial variability of the peat deposits across the Application Site.

Three no. phases of trial pit investigations have been completed at the Proposed Project site by FTC (6th to 9th April 2021) and Irish Drilling Ltd (23rd to 28th March 2022, and 24th to 26th October 2023). The trial pit excavations were completed to characterise the nature of the underlying mineral subsoils.

In addition, IDL drilled 10 no. boreholes at the Proposed Project site between 8th and 24th November 2023 in order to investigate the deeper geological profile including the depth and nature of the underlying bedrock geology.

The combined geological dataset collated by HES, MKO, FTC and IDL has been used in the preparation of this EIAR Chapter and provides a comprehensive understanding of the peat depth, ground conditions and geological characteristics of the Proposed Project site.

The site investigations to address the land, soils and geology chapter of this EIAR include the following:

- Detailed walkover surveys of the Proposed Project site completed by HES, MKO and FTC;
- A total of 722 no. peat probes have been completed at the Proposed Project site by HES, MKO and FTC across multiple phases of site investigations:
    - HES completed a total of 94 no. peat probes in 2021;
    - HES completed 19 no. probes in 2024;
    - MKO completed a total of 303 no. peat probes in 2024;
    - MKO completed 25 no. probes in 2025; and,
    - FTC completed 281 no. peat probes in 2022.
- Logging of subsoil exposures across the site where mineral soils and peat profiles are exposed;
- Mineral subsoils and peat were logged according to BS: 5930 and Von Post Scale respectively;
- Ground investigations completed by FTC and IDL comprising of 63 no. trial pits and 10 no. boreholes; and,
- Detailed walkover survey and visual assessment of the Proposed Grid Connection for exposed soils, subsoils, bedrock, and topographic changes.

Site specific data obtained by HES, FTC and MKO was supplemented with recent and historic site-specific data supplied by the Applicant. These data include habitat, soils/land, lidar and topographic maps and information for the Proposed Project site. The information is included in the Lemanaghan Draft Cutaway Bog Decommissioning and Rehabilitation Plan (hereafter referred to as the Draft Rehabilitation Plan) attached as Appendix 2-4.

All site investigation informed the Geotechnical and Peat Stability Assessment Report (PSRA) (FTC, 2025) and Peat and Spoil Management Plan (FTC, 2026) attached as Appendix 8-1 and Appendix 4-3 respectively. The site investigation reports, associated trial pit and boreholes logs and laboratory reports for the 3 no. phases of site investigations detailed above are included as appendices (Appendix E to Appendix G) to the PSRA (Appendix 8-1).

8.2.3 Impact Assessment Methodology

Using information from the desk study and data from the site investigations, an assessment of the importance of the land, soil and geological environment within the Proposed Project site is assessed using the criteria set out in Table 8-2 (National Roads Authority, 2008).

Table 8-2 Estimation of Importance of Soil and Geology Criteria (NRA, 2008).

Importance	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 (National Heritage Area). 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. Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site). Well drained and/or highly 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 landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral Resource.

The EPA document '*Guidelines on the information to be contained in Environmental Impact Assessment Reports*' (EPA, 2022), hereafter the EPA 2022 Guidelines, states that there are 7 no. steps in the preparation of the EIAR. The initial 4 steps relate to screening, scoping, the consideration of alternatives and the description of the project. Step 5 relates to the description of the baseline environment which is presented in Section 8.3 for the land, soils and geological environment. Step 6 relates to the assessment of impacts and is presented in Section 8.5. The guideline criteria for the assessment of effects states that the purpose of an EIAR is to identify, describe and present an assessment of the likely significant effects. The likely effects are described with respect to their quality (positive, neutral or negative), significance (imperceptible to profound), extent (i.e. size of area or number of sites effected), context (is the effect unique or being increasingly experienced), probability (likely or unlikely), duration (momentary to permanent), frequency and reversibility. The descriptors used in this chapter are those set out in the EPA 2022 Guidelines glossary of effects as shown in Section 1.7.2 of Chapter 1 of this EIAR. In addition, the two impact characteristics, proximity and probability are described for each impact, and these are defined in Table 8-3.

Table 8-3: Impact descriptors related to the receiving environment.

Impact Characteristics		Potential Hydrological Impacts
Quality	Significance	
Negative only	Profound	Widespread permanent impact on: › The extent or morphology of a designated site. › Regionally important aquifers. › Extents of floodplains. Mitigation measures are unlikely to remove such impacts.
Positive or Negative	Significant	Local or widespread time-dependent impacts on: › The extent or morphology of a designated site / ecologically important area. › A regionally important hydrogeological feature (or widespread effects to minor hydrogeological features). › Extent of floodplains. Widespread permanent impacts on the extent or morphology of a Natural Heritage Area (NHA) /ecologically important area. Mitigation measures (to design) will reduce but not completely remove the impact – residual impacts will occur.
Positive or Negative	Moderate	Local time-dependent impacts on: › The extent or morphology of a Special Area of Conservation (SAC) / NHA / ecologically important area. › A minor hydrogeological feature. › Extent of floodplains. Mitigation measures can mitigate the impact OR residual impacts occur, but these are consistent with existing or emerging trends
Positive, Negative or Neutral	Slight	Local perceptible time-dependent impacts not requiring mitigation.
Neutral	Imperceptible	No impacts, or impacts which are beneath levels of perception, within normal bounds of variation, or within the bounds of measurement or forecasting error.

8.2.4 Study Area

The study area for the land, soils and geological environment is limited to within the Proposed Project site *i.e.* EIAR Site Boundary; see Section 1.1.1 of Chapter 1 for further information. There is no potential for the Proposed Project to affect the land, soils and geological environment outside of the Proposed Project site.

8.2.5 Limitations and Difficulties Encountered

No limitations or difficulties were encountered during the preparation of the Land, Soils and Geology Chapter of this EIAR. The site investigations completed as part of the baseline assessment were thorough and exhaustive.

8.3 Existing Environment

8.3.1 Site Description and Topography

The Proposed Project site is predominantly located within Lemanaghan Bog, a large BnM bog which forms part of the wider Boora Bog Group. The Proposed Project site, which includes both the Proposed Wind Farm and the Proposed Grid Connection, comprises an area of 1,258 hectares (ha).

The Proposed Wind Farm is located approximately 3km northeast of Ferbane and approx. 2.5km southwest of the village of Ballycumber in Co. Offaly. The Proposed Wind Farm extends across several townlands which are listed in Table 1-1 of Chapter 1. The Proposed Project site measures approximately 5.4km in length, and approximately 4.9km at its widest point. Grid Reference co-ordinates for the approximate centre of the site are X616027, Y728163 (ITM Coordinates).

The Proposed Wind Farm is connected by a disused railway to Bellair South Bog to the north and to the Blackwater Bog Group to the west. The R436 Regional Road passes along much of the southern boundary of the Proposed Wind Farm with Derrynagun and Curraghalassa bogs located to the south of the R436 regional road. The N62 National Road skirts the extreme western tip of the Proposed Wind Farm. The L7002 local road passes through the northern part of the Proposed Wind Farm and the L7001 runs to the north of the Proposed Grid Connection. The site is currently accessed via current an existing entrance off the N62 National Road and 1 no. existing entrance along the R436 in the south of the Proposed Wind Farm. Please see Table 4-9 in Chapter 4 for further detail on site entrances.

The current topography of the Proposed Wind Farm is relatively flat with an elevation range of between approximately 50 and 62mOD (metres above Ordnance Datum). Topography at the Proposed Wind Farm has been modified through industrial peat extraction activities and all ancillary works including associated drainage works. Today the highest elevations are found at headlands and remnant peat banks which create a boundary berm, forming a basin effect within the former extraction areas of the bog. These remnant peat banks and headlands provide an approximation (albeit drained and subsided) of the original ground elevations which existed across the Proposed Project site prior to the commencement of any peat extraction activities.

The Proposed Project also includes turbine delivery route (TDR) accommodation works at Kennedy's Cross in the townland of Ballindown, Co. Offaly at the junction of the N52 and N64.

8.3.2 Land and Land use

Corine land cover maps (2018) (www.epa.ie) show that the Proposed Project is predominantly comprised of 'peat bogs', located in a largely agricultural area. Landcover in the surrounding area is mapped as 'agricultural pastures' while small areas of 'transitional woodland scrub' are mapped along the northern and eastern boundaries of the site. A small area of 'coniferous forestry' is located to the south. Meanwhile, Corine also maps an area of 'land principally occupied by agriculture with significant areas of natural vegetation' in the interior of the site. This corresponds to the location of a mineral soil island. A scattered pattern of rural dwellings and farmhouses are located along the local road network which surrounds the Proposed Project.

Land and landcover at the Proposed Wind Farm was verified during site walkover surveys and from inspection of recent aerial photography and BnM habitat mapping. Industrial peat extraction activities

ceased at the Proposed Project site in June 2020. All stockpiles had been removed from the site by the end of 2024. The decommissioning works relating to the railway network within the Proposed Project site are in the process of being completed. Land use at the Proposed Project site now comprises primarily bare cutaway peat with developing pioneer vegetation.

Historic Corine land cover maps and BnM annual reports were consulted to investigate how land cover has changed historically at the site and in the surrounding lands.

The main historic land use changes at the site have been associated with the peat production operations, with the main changes linked to the initial drainage of the bog and the removal of vegetation in advance of production. The key dates in terms of drainage, the onset of peat extraction and the cessation of peat extraction activities at the Proposed Project site are summarised in Table 8-4.

BnM's peat production maps (these are internal mapping datasets which show the extent, layout and status of peat extraction areas on bogs managed by BnM) for 2020 indicate that 696ha was subject to peat extraction whilst peat was no longer being extracted from 338ha of former peat production fields. According to this peat production map, the areas where production first ceased, towards the south and southwest of the Proposed Wind Farm, corresponds with the areas which were noted to be revegetating during the site walkover surveys. These areas are also shown to not have been subject to peat extraction in the 2004 peat production maps and therefore have had a significant period of time for revegetation to occur.

Table 8-4: First Drainage and First Production Years of Lemanaghan Bog

Bog Name	Bog Area (ha)	Site Preparation Works (removal of vegetation and drainage insertion)	First Production Year	Cessation of Industrial Peat Extraction
Lemanaghan Bog	1,109	1950	1960	June 2020

In terms of the Proposed Grid Connection, the proposed onsite 220kV electricity substation, the wind farm control buildings and telecommunications tower are proposed in the area of cutover bog. Meanwhile, the connection to the overhead line including the 4 no. steel masts and 2 no. gantry structures are located in agricultural pastures.

The TDR accommodation works at Kennedy's Cross are mapped by Corine (2018) in an area of agricultural pastures.

8.3.3 Peat/Soils and Subsoils

8.3.3.1 Desk Study

The published Teagasc soils map (www.gsi.ie) for the local area shows that the Proposed Project site is mapped to be almost exclusively overlain by cutover/cutaway peat. There are some very small, localised pockets of mainly basic peaty poorly drained mineral soils (BminPDPT) and basic poorly drained mineral soils (BminPD) mapped within the Proposed Project site. Soils mapped in the surrounding lands comprise largely of basic deep well drained mineral soil (BminDW) to the north and west, basic shallow well drained mineral soil (BminSW) to the east and cutover peat to the south. Mineral alluvium (AlluvMIN) is mapped along many of the local watercourses in the surrounding lands, with significant alluvium deposition along the Brosna River to the south and east of the Proposed Wind Farm.

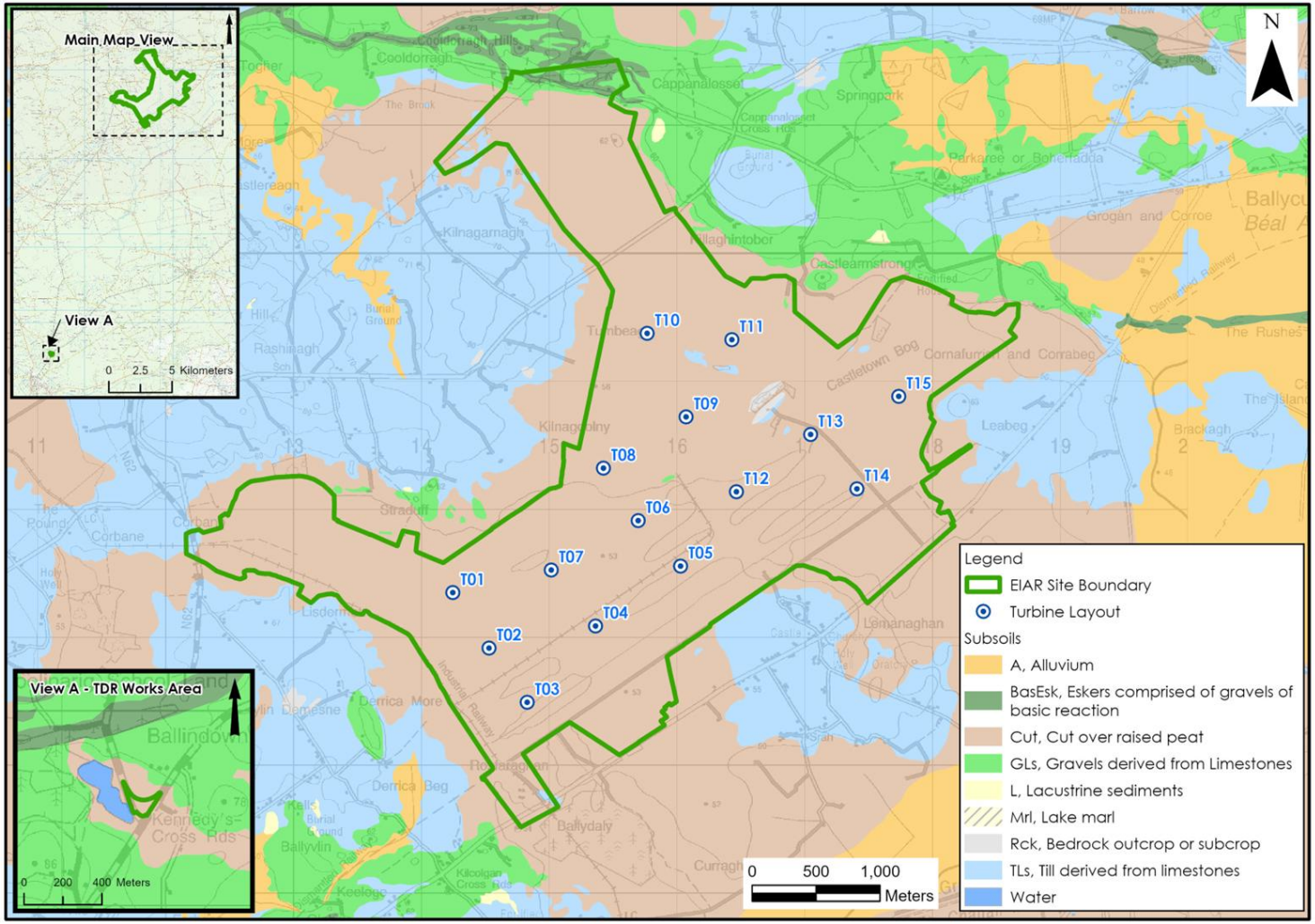
In terms of the Proposed Project infrastructure, all infrastructure is mapped on cutover peat with the exception of the northern section of the temporary access road associated with the Proposed Grid Connection which is mapped to be overlain by mainly basic shallow well drained mineral soils.

The published GSI subsoils map (www.gsi.ie) shows that the Proposed Project site is underlain predominantly by cut over raised peat (Cut). The GSI also map some small, isolated pockets of gravels derived from limestone (GLs) and till derived from limestones (TLs). The island of agricultural land surrounded by Lemanaghan Bog is mapped to be underlain by tills derived from limestones (TLs) and bedrock outcrop or subcrop (Rck). Subsoils in the surrounding lands are mapped largely as cutover peat, tills derived from limestone and gravels derived from limestone. Meanwhile, some esker sands and gravels are also mapped to the northeast. Alluvium subsoils are mapped ~1.5km to the south of the Proposed Project site and 400m to the east along the Brosna River and its tributaries. An area of lake marl (Mrl) is also mapped approximately 700m to the southeast in the townland of Derrynagun.

In terms of the Proposed Project infrastructure, all proposed infrastructure is mapped to be underlain by cut over raised peat, with the exception of the northern section of the temporary access road associated with the Proposed Grid Connection which is mapped to be underlain by gravels derived from limestones (GLs). The thickness of the peat and the nature of the underlying subsoils have been verified by intrusive site investigations as described in Section 8.3.3.2 below.

The TDR accommodation works at Kennedy's Cross are mapped to be underlain by cut over raised peat by the GSI. A map of the local subsoil cover is attached as Figure 8-1.

Figure 8-1: Local Subsoils Map



8.3.3.2 Site Investigation Data

The soils and subsoils present at the Proposed Project site have been verified during site walkover surveys and intrusive site investigations.

Peat Probing

As detailed in Section 8.2.2 above, total of 722 no. peat probes have been completed at the Proposed Project site by HES, MKO and FTC. This entire dataset is presented and discussed below.

Peat depth intervals recorded across the site are shown on the histogram presented as

Figure 8-2. The combined peat probe dataset shows that peat depths across the Proposed Project site range from 0 to >6m with an average peat depth of 2m. 36% of peat depth probes recorded peat depths of 1.0m to 2.0m, and 23% of peat depth probes recorded peat depths of 2.0m to 3.0m. The remaining 20% of probes recorded peat depths of between 3.0 to 6.2m. All peat probe locations are shown on Figure 8-3 and Figure 8-4.

Shown on Table 8-5 below is a summary of the peat depth and mineral subsoil lithology at the Proposed Project site locations as recorded during HES peat probing investigations. The average depth and peat depth range recorded during the combined site investigations is also included in Table 8-5 for all key development infrastructures.

Based on HES and FTC site data, peat depths at the proposed turbine locations range from 0.10 - >4.5m. Available site data indicated that at least 80% of the 15 no. proposed turbine locations have a peat depth of ≤3m. Peat in excess of 3m was only recorded at T15 and at T1. The greatest peat depths were recorded in the north of the Proposed Project site, with deep peat encountered at the proposed onsite 220kV substation location (5-5.5m).

Subsoils encountered during the peat probing investigations comprised predominantly of grey, gravelly lacustrine clay which was occasionally found to be overlain by a creamy shelly marl. Other sub-peat subsoils encountered included grey silty or gravelly CLAY, with some probes terminating on a hard base (interpreted to be gravels or cobbles). Further details on sub-peat subsoils were obtained from the intrusive site investigations, comprising of trial pits and boreholes, which are described below.

In addition to the peat probing FTC completed in-situ shear vane testing at selected location across the Proposed Project site to provide a representative coverage of indicative peat strengths. The results of the vane testing are presented in the PSRA (Appendix 8-1). The hand vane results indicate undrained shear strengths in the range 12 to 65kPa, with an average of 43kPA. The recorded shear strengths are typical of well-drained peat and are significantly greater than those which were recorded at sites of known peat failures. For example, the undrained shear strength of the site of the Derrybrien failure was estimated to be 2kPA.

Table 8-5: Peat Depths at Key Development Locations

Location	Summary of Underlying Mineral Subsoil Lithology (HES)	Peat Depth Range (m)	Average Peat Depth (m)
T1	No returns	3.1 – 3.6	3.5
T2	Marl over Lacustrine CLAY	0.9 – 1.7	1.2
T3	Lacustrine CLAY	1.5 – 2.2	1.8
T4	Gravelly CLAY	0.1 – 0.4	0.2
T5	Silty SAND	0.7 – 1.3	1.0
T6	Marl over Lacustrine CLAY	1.5 – 2.4	1.9
T7	Hard base -no returns	1.8 – 2.7	2.2
T8	Lacustrine CLAY	0.9 – 1.8	1.2
T9	Gravelly CLAY	1.0 – 1.7	1.3
T10	Gravelly CLAY over Lacustrine CLAY	0.9 – 2.0	1.5
T11	Gravelly SILT over gravelly CLAY	0.9 - 1.7	1.2
T12	Marl over silty CLAY	1.3 – 1.5	1.4
T13	Lacustrine CLAY	0.7 – 2.0	1.3
T14	Lacustrine CLAY	0.3 – 1.3	1.0
T15	No returns	3.6 – 4.1	3.8
Substation	Hard base – no returns	5.0 – 7.1	5.5
Met Mast	Lacustrine CLAY	1.8 – 3.2	2.5
Infrastructure Element		Peat Depth Range (m)	Average Peat Depth (m)
Telecoms Tower		5.2 – 6.0	6.0
Steel Mast 1 (under OHL west)		1.0	1.0
Steel Mast 2 (under OHL east)		0.2	0.2
Steel Mast 3 (west of substation)		5.3	5.3
Steel Mast 4 (east of substation)		5.2	5.2
Crane Pad (OHL)		0.4 – 0.7	0.6
Crane Pad (substation)		2.4 – 6.0	4.2
Tower Build Area (OHL)		0.5 – 3.0	3.0
Tower Build Area (substation)		2.0 – 5.0	3.5
Construction Compound 1		2.5 – 5.4	3.9
Construction Compound 2		1.9 – 2.3	2.1

Location	Summary of Underlying Mineral Subsoil Lithology (HES)	Peat Depth Range (m)	Average Peat Depth (m)
Construction Compound 3		0.6 – 2.2	1.2
Construction Compound 4		3.0 – 3.8	3.4
Construction Compound 5		2.0 – 5.5	4.0
Borrow Pit 1		1.6 – 4.2	2.9
Borrow Pit 2		0.2	0.2
Borrow Pit 3		0.6	0.6
Borrow Pit 4		0.7 – 1.2	1.0

Figure 8-2: Residual Peat Depths at the Proposed Project site (combined HES, FTC and MKO peat probes)

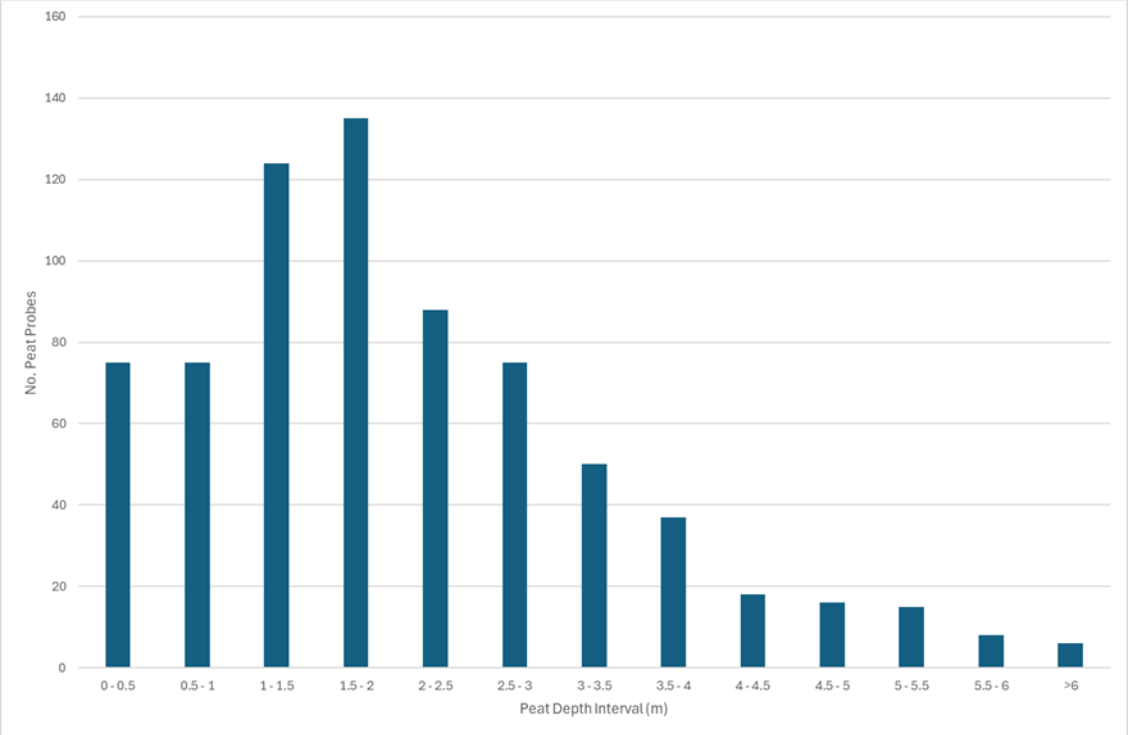


Figure 8-3: Peat depth across the Proposed Project site

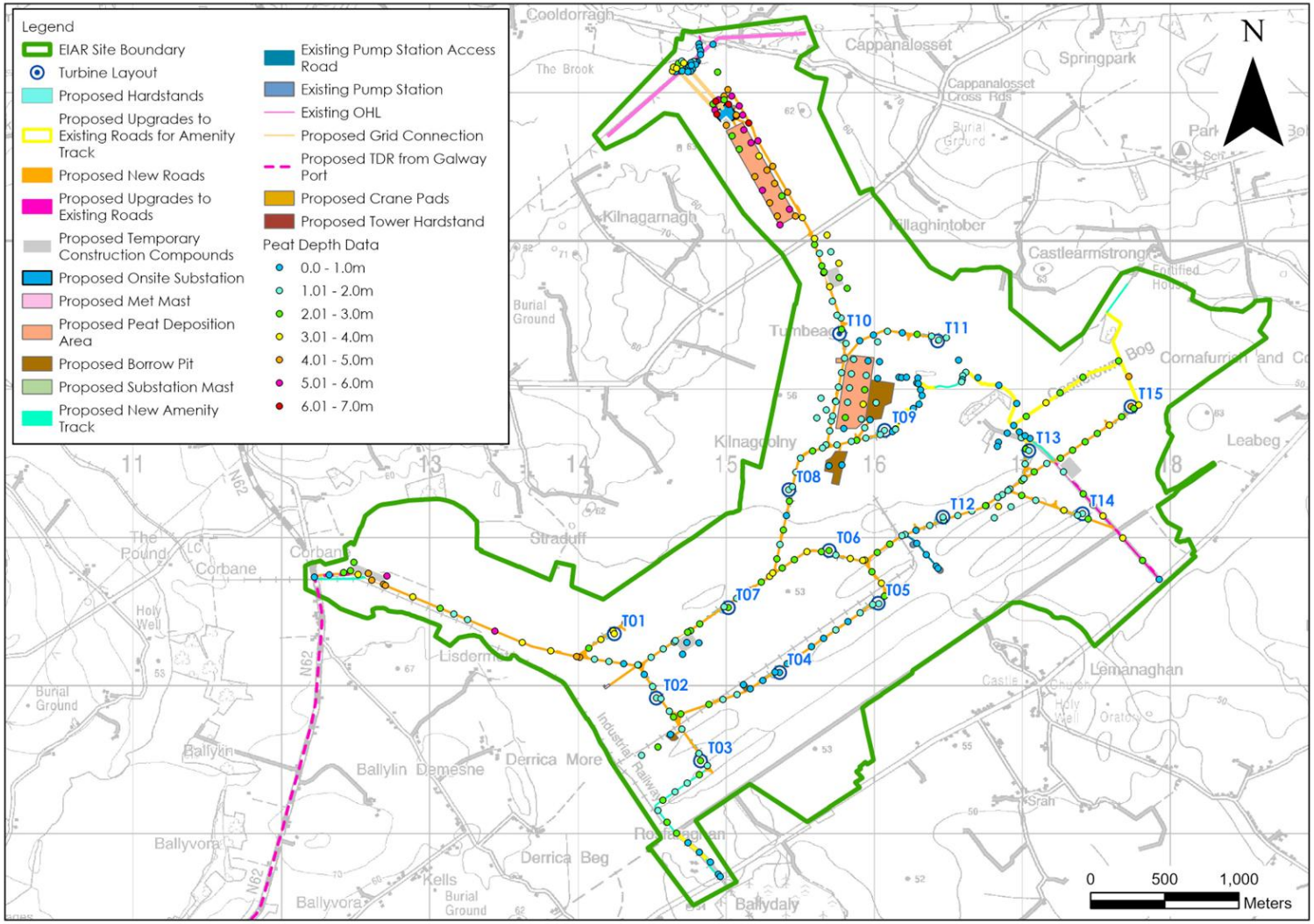
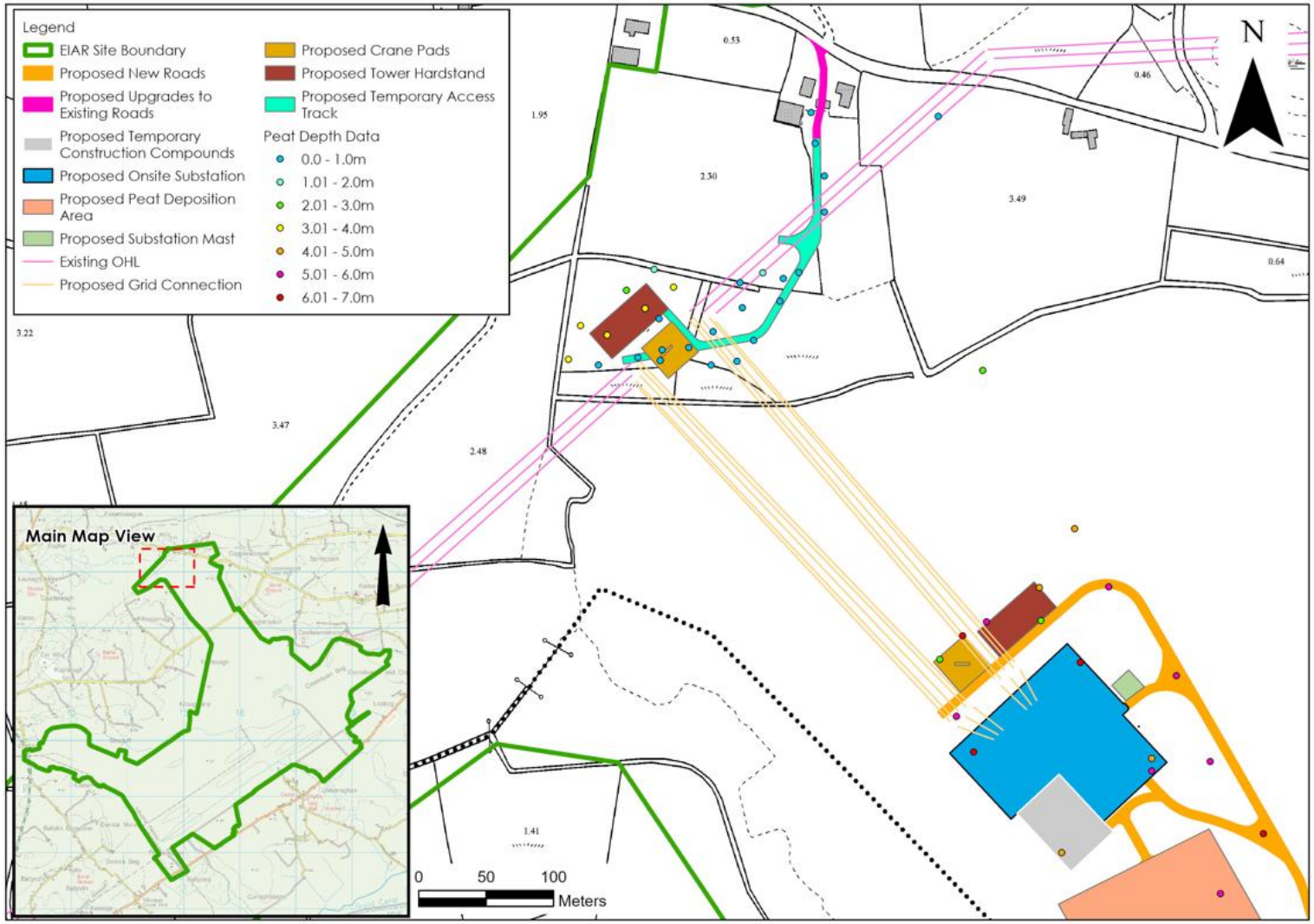


Figure 8-4: Peat depths at the Proposed Grid Connection



Trial Pits and Boreholes

A total of 63 no. trial pits have been excavated at the Proposed Project site across 3 no. phases of site investigations. A total of 28 no. trial pits were excavated in 2021 by FTC, with 19 no. trial pits excavated in 2022 by IDL. An additional 16 no. trial pits were excavated at the site by IDL in 2023. IDL also drilled 10 no. boreholes at the Proposed Project site in 2023. The location of the trial pits and boreholes are shown in Figure 8-6.

The trial pits extended to a maximum depth of 4.9mbgl (metres below ground level). Peat was encountered in all trial pits with peat depths ranging from 0.2 to 4.9mbgl. Glacial tills were generally found to underlie the peat deposits and were typically described in the logs as consisting of bluish grey, slightly sandy, SILY/CLAY and/or silty clayey SANDS and GRAVELS and/or slightly gravelly sandy SILT/CLAY with cobbles and boulders. Trial pit logs are included in Appendix E to Appendix G of the PSRA (Appendix 8-1).

The boreholes ranged in depth from 8.5 to 19.2mbgl. Ground conditions encountered during the borehole drilling comprised of peat overlying glacial till overlying bedrock. Summary data for the boreholes are included in Appendix G of the PSRA (Appendix 8-1).

Particle Size Distribution (PSD) analysis was completed at 28 no. trial pit locations (11 in Phase 1, 6 in Phase 2 and 11 in Phase 3). The PSD analysis reports are included as appendices to the PSRA which is attached as Appendix 8-1. The results of the PSD analysis are also presented in Figure 8-5. The PSD results are summarized below:

- In the samples recovered from the Phase 1 trial pits, the gravel component of the recovered subsoils ranged from 0 to 89%, the sand component ranged from 5 to 76%, the silt component ranged from 0 to 67% whilst the clay component ranged from 0 to 29%.
- In the samples recovered from the Phase 2 trial pits, the gravel component of the recovered subsoils ranged from 3 to 71%, the sand component ranged from 5 to 40%, the silt component ranged from 0 to 42%, whilst the clay component ranged from 0 to 50%.
- In the samples recovered from the Phase 3 trial pits, the gravel component of the recovered subsoils ranged from 0 to 63%, the sand component ranged from 5 to 47%, the silt component ranged from 0 to 53%, whilst the clay component ranged from 0 to 69%.

The PSD data indicates variable subsoil types underlying the peat deposits at the Proposed Project site.

Figure 8-5: PSD Analysis of Subsoil

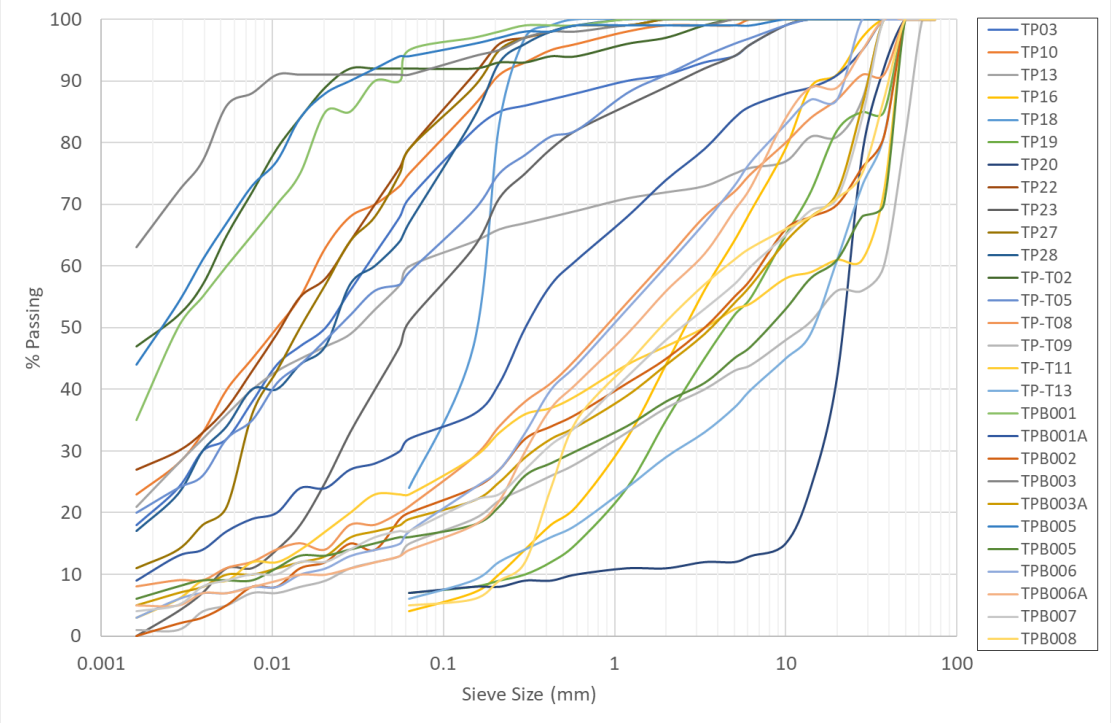
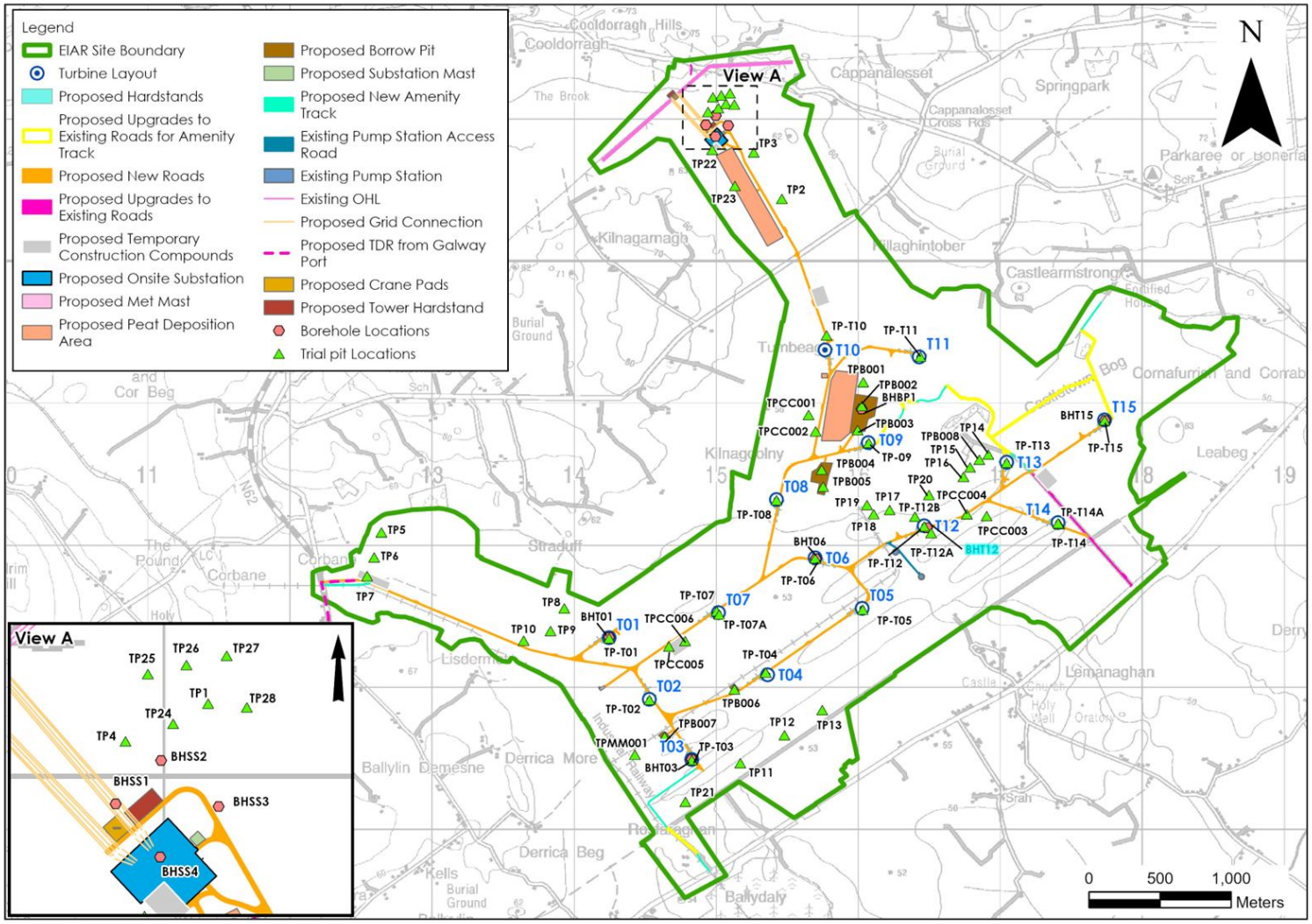


Figure 8-6: Site Investigation Locations (Trial Pits and Borehole)



8.3.4 Bedrock Geology

8.3.4.1 Desk Study

The GSI (www.gsi.ie) map several bedrock geological formations underlying the Proposed Project site.

The bedrock geology of the local area is characterised by the presence of a large anticlinal structure, known as the Ferbane Inlier. Devonian Kiltorcan-type Sandstones of this body form the core of this major northeast southwest trending anticlinal structure. The sandstones are overlain to the northwest and southeast by Dinantian Sandstones, Shales and Limestones which are in turn overlain by Dinantian Lower Impure Limestones.

The anticlinal fold axis of the Ferbane Inlier is mapped underlying the south of the Proposed Project site. Here the GSI map the presence of the Devonian Old Red Sandstones (Devonian Kiltorcan-type sandstones) which form the core of this structure and are comprised of red conglomerates, sandstones and mudstones. The GSI map these sandstones to be overlain by the Navan Beds (Dinantian Sandstones, Shales and Limestones) which consist of dark limestone, mudstone and sandstone. The Navan Beds are in turn overlain by the Ballysteen Formation (Dinantian Lower Impure Limestone). This bedrock geological formation is comprised of dark muddy limestone and shale.

In terms of Proposed Project infrastructure:

- A total of 5 no. turbines (T01, T08, T09, T10 and T11), 3 no. temporary construction compounds (TCC1, TCC4 and TCC5), 2 no. borrow pits (BP03 and BP04), and the proposed onsite 220kV substation and all associated Proposed Grid Connection infrastructure, are underlain by the Waulsortian Limestones;
- 1 no. turbine (T02), 1 no. temporary construction compound (TCC3) and 1 no. borrow pit (BP01) are mapped to be underlain by the Ballysteen Formation;
- 5 no. turbines (T03, T04, T06, T07 and T13) and 1 no. borrow pit (BP02) are mapped to be underlain by the Navan Beds; and,
- 4 no. turbines (T05, T12, T14 and T15) and 1 no. temporary construction compound (TCC2) are mapped to be underlain by the Old Red Sandstones.
- TDR accommodation works at Kennedys Cross are underlain predominantly by Visean Limestones, with a small area underlain by Waulsortian Limestones.

A major fault, known as the Ferbane Fault, is mapped along the northwestern side of the inlier (trending northeast to southwest) down throwing the succession to the northwest of the fault. This major fault is mapped below the centre of the Proposed Project site and juxtaposes the Waulsortian Limestones against the older Navan Beds and Ballysteen Formations. The Waulsortian Limestone (Dinantian Pure Unbedded Limestones) comprise of massive, unbedded lime-mudstones and underlier the northwest of the Proposed Project site. The Ferbane Fault is itself displaced by several smaller northwest to southeast trending faults.

Whilst several of these faults are mapped in close proximity to the Proposed Project infrastructure, these faults were active 100s of millions of years ago and pose no risk to the Proposed Project.

The GSI do not map the presence of any karst features within the Proposed Project site. The closest mapped karst features include a swallow hole and a spring located approximately 300m and 500m east of the Proposed Project site respectively in the townland of Castlearmstrong. The GSI also record the presence of superficial solution features in the townland of Ballyfin, approximately 2km west of the Proposed Project site.

The GSI do not map any significant areas of bedrock outcrop within the Proposed Project site. Some small areas of bedrock outcrop on the mineral island located within the site.

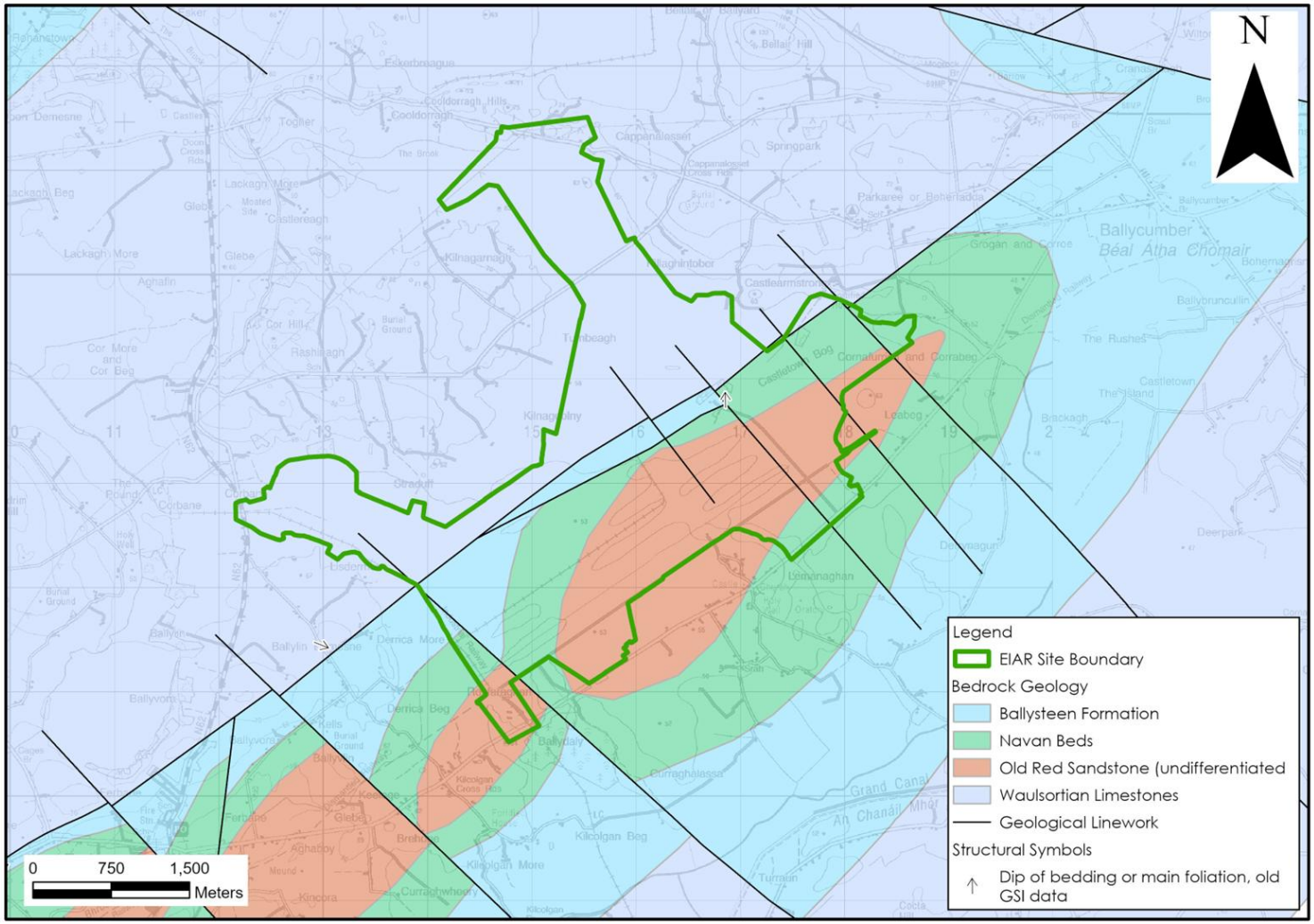
8.3.4.2 Site Investigation Data

No bedrock was encountered in any of the 63 no. trial pits completed at the Proposed Project site which extended to a maximum depth of 4.9mbgl. However, it is noted that 3 no. trial pits were terminated due to obstructions, described as large boulders or possible rock. These obstructions were recorded at depths of 2 to 4mbgl.

The 10 no. boreholes drilled by IDL extended to depths ranging from 8.5 to 19.2mbgl. Bedrock was encountered at depths ranging from 1.7 to 14.6mbgl with an average of 9.3mbgl. Weathered rock described as stiff, sandy gravelly silt with gravels comprised of fine grained limestone was encountered at depths of 9.8, 12.9 and 14.6mbgl in 3 no. boreholes. Meanwhile, competent bedrock was recorded in 8 of the boreholes and was typically described as very strong thinly bedded grey and dark grey silty bioclastic fine and medium grained LIMESTONE. The boreholes logs are included as Appendix G of Appendix 8-1.

A bedrock geology map of the area is attached as Figure 8-7.

Figure 8-7: Bedrock Geology Map



8.3.5 Soil Contamination

According to the EPA online mapping (www.epa.ie), there are no licenced waste facilities or dump sites within the Proposed Project site or its immediate environs. The closest EPA mapped waste facility is Ballydonagh Landfill located in excess of 9km to the northwest of the Proposed Project site.

An Integrated Pollution Control (IPC) Licence (P0500-01) was granted to Bord na Móna Energy Ltd on 28/04/2000 for the industrial extraction of peat at the Boora Bog Group. Condition 7 referred to Waste Management whereby all hazardous waste materials (oils, oil filters, batteries, etc.) were required to be disposed of by licenced waste contractors.

The EPA do not map any other Industrial Emissions Licensing (IEL) facilities or Integrated Pollution Control (IPC) facilities in the area of the Proposed Project site. The closest mapped IEL facility is the ESB Power Generation facility located at Cloghan (Ferbane), Co. Offaly (P0695). This facility is situated approximately 6km southwest of the Proposed Project site.

The GSI do not map the presence of any historic quarries or pits within the Proposed Project site. Several historic gravel pits dating from the early to mid-20th century are located in the lands surrounding the Proposed Project site. Several historic pits are located to the southwest of the Proposed Project site along the R436 and to the northeast of the Proposed Project site in the townland of Castlearmstrong. A gravel pit dating from the mid to late 19th century is also mapped to the north of the Proposed Project site in the townland of Straduff.

During the site walkover surveys, no areas of particular contamination concern were identified within the Proposed Project site. Some minor fly-tipping was noted along the edge of access tracks.

8.3.6 Economic Geology

The GSI Online Minerals Database accessed via the Public Data Viewer (www.gsi.ie) shows a small number of historic quarries and pits in the lands surrounding the Proposed Project site as described above in Section 8.3.5. However, none of these historic extraction localities are located within the Proposed Project site.

The GSI (www.gsi.ie) record the presence of a mineral locality in the townland of Kilnagoolny, where deposits of marl are mapped within the Proposed Project site. This mineral occurrence is further described by the GSI as "*shelly marl seen in section in Lemanaghan Bog. Over 51cm thick. Underlain by alluvial clays and sand*". The presence of shelly marl corresponds with the marl encountered during by HES during the peat probing investigations. There are no other mineral localities mapped within the Proposed Project site.

The closest GSI mapped (www.gsi.ie) active sand and gravel pit is located to the southwest of Ferbane and 5km to the southwest of the Proposed Project site. Several other active sand and gravel pits are also located to the northwest of the Proposed Project site in the townland of Clonfinlough. These pits are located approximately 5.6km, 5.5km and 7.5km from the Proposed Project site respectively. The GSI do not map the presence of any active bedrock quarries in the local area.

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) shows that the crushed rock aggregate potential of the Proposed Project site ranges from 'Very Low' to 'Very High'. The vast majority of the south and east of the Proposed Project site is mapped as having 'Very Low' potential for a bedrock quarry. Meanwhile, the northwest is mapped predominantly has having 'Moderate' potential. The Ferbane Fault delineates that boundary between the areas of 'Very Low' and 'Moderate' potential. Meanwhile, a very small area associated with the island of agriculture land in the interior of the bog, is mapped as having 'High' to 'Very High' potential for a bedrock quarry. The bedrock underlying the

Proposed Project site could be classified as 'Medium' importance (refer to Table 8-2). The bedrock could be used on a "sub-economic" local scale for construction purposes. The bedrock has not been used in the past at the Proposed Project site for this purpose, likely because of the covering of peat and glacial till overburden in the area.

Furthermore, the vast majority of the Proposed Project site is not located within an area mapped for granular aggregate potential (i.e. potential for gravel reserves). Only very small, isolated areas adjacent to the island of agricultural land in the centre of the bog are mapped as having 'Low' to 'Moderate' potential. Meanwhile the northernmost section of the Proposed Project site is mapped as having 'High' potential. The only infrastructure located in this area of 'High' potential is a small section of the temporary access road associated with the Proposed Grid Connection infrastructure in the agricultural lands in the north of the Proposed Project site. The overlying peat and soils deposits at the Proposed Project site could be classified as 'Low' importance as the peat is not designated in this area and is significantly degraded in most places as a result of industrial peat extraction and drainage. Refer to Table 8-2 for definition of these criteria.

Please note, the TDR accommodation areas at Kennedy's Cross are not mapped in an area of granular aggregate potential whilst the crushed rock aggregate potential is mapped by the GSI as high. Several quarries are mapped in the local area including Loughnane Concrete along the N52.

8.3.7 Geological Heritage Sites

The Clonmacnoise Esker County Geological Site (CGS) (Site Code: OY008) is mapped in the very north of the Proposed Project site. This CGS is located between Lemanaghan and Bellair South bogs. According to the Offaly County Geological Site Report for this CGS, available at www.gsi.ie, this esker is important as it is the longest esker system in the country and is a superb example of a relict subglacial conduit. This CGS is recommended for designation as a Natural Heritage Area (NHA). No infrastructure associated with the Proposed Project overlaps with this CGS. The closest infrastructure is associated with the Proposed Grid Connection in the agricultural lands in the north of the Proposed Project site. The proposed temporary access track is located approximately 45m from the mapped extent of the CGS. Meanwhile, approximately 15m of an existing road to be upgraded passes through the mapped extent of the CGS.

No other geological heritage sites overlap with the Proposed Project site (www.gsi.ie). Other geological heritage sites within 5km of the Proposed Project site include Ballyin Mushroom Rock CGS (Site Code: OY002) and Clara Bog (Site Code: OY005), located approximately 1.25km to the west and 4.2km to the east of the Proposed Project site respectively. Clara Bog is recommended for designation as an NHA. Meanwhile, Endrim Mushroom Rock CGS is located approximately 3.8km to the west.

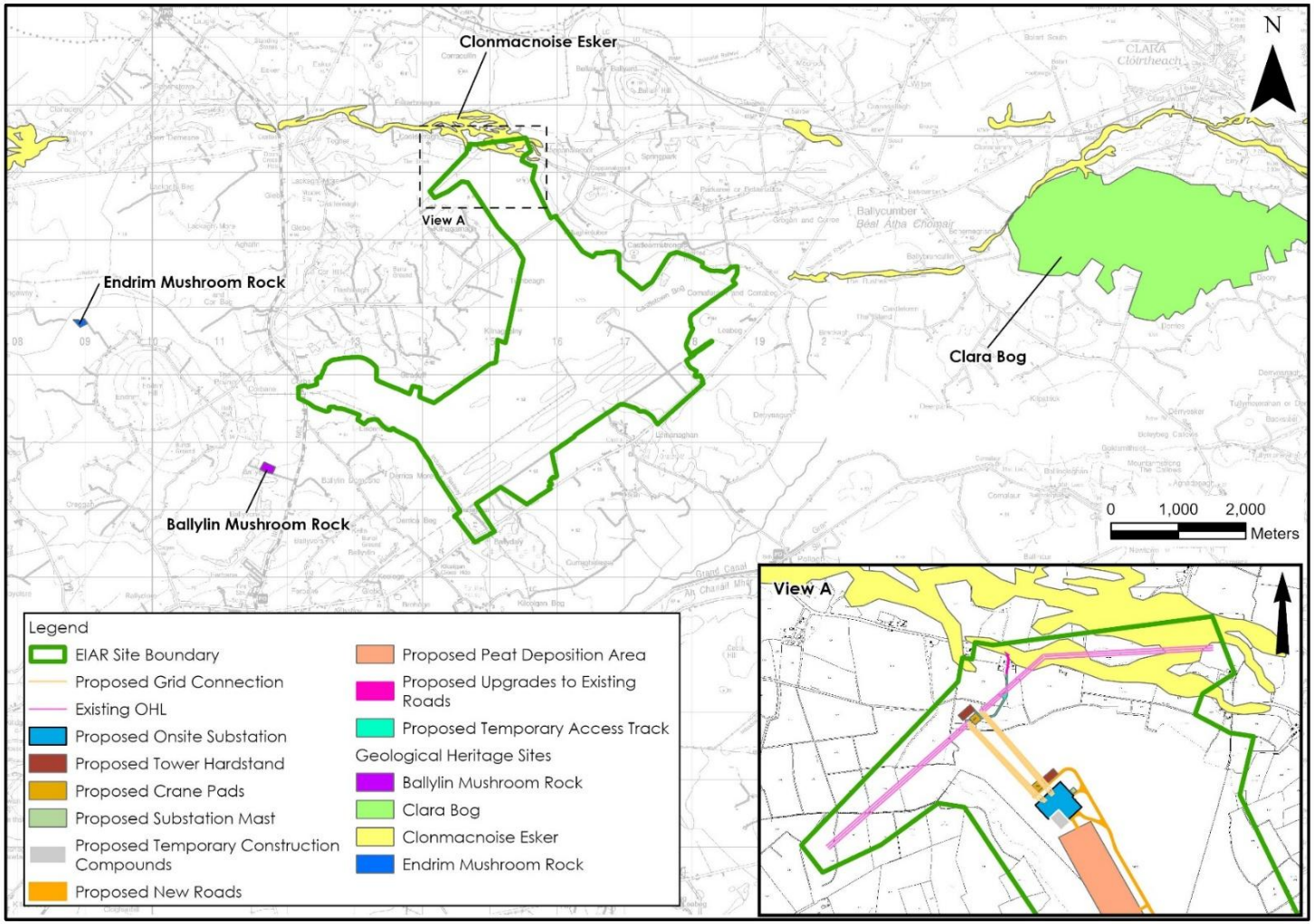
Please note, the TDR accommodation area at Kennedy's Cross is not located within any geological heritage site. The Kilcormac Esker CGS, which is recommended for Geological NHA designation, is located ~250m north of the works area.

Table 8-6 below presents summary details of the geological heritage sites within 5km of the Proposed Project site. A map of local geological heritage sites is attached as Figure 8-8.

Table 8-6: Regional Geological Heritage Sites

Site Code	Site Name	IGH Theme	Description
OY002	Ballylin Mushroom Rock	IGH1	A Mushroom Rock – isolated upstanding rock in a wheat field
OY008	Clonmacnoise Esker	IGH7	The Clonmacnoise Esker and surrounding sands and gravels includes an exceptionally large accumulation of sands and gravels deposited both under the ice sheet and at its margin as the ice withdrew westwards across Offaly at the end of the last Ice Age. The esker forms part of the larger Ballinasloe-Split Hills-Clonmacnoise-Clara Esker System, which extends from Galway, through Offaly, and into Westmeath, and is the traditional route defined as the 'Eiscir Riada' in ancient Irish Folklore
OY005	Clara Bog	IGH7	An expansive area of raised peat bog situated 2km south of Clara town.
OY017	Endrim Mushroom Rock	IGH7	A Mushroom Rock – isolated upstanding rock in a grass field.
OY018	Kilcormac Esker	IGH7	Example of a deglacial, meltwater deposited complex.

Figure 8-8: Geological Heritage Sites Map



8.3.8 Designated Sites

Within the Republic of Ireland designated sites include National Heritage Areas (NHAs), Proposed National Heritage Areas (pNHAs), Special Areas of Conservation (SAC), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs).

The Proposed Project site is not located within any designated site. The main potential for effects on designated sites is via surface water connectivity with downstream receptors. This is assessed in Section 9.3.14 of Chapter 9: Water.

Designated sites within 5km of the Proposed Project site include:

- Clara Bog SAC and pNHA (Site Code: 000572), approx. 3.1km to the east;
- Ferbane Bog SAC and pNHA (Site Code: 000575), approx. 1.1km to the west;
- Grand Canal pNHA (Site Code: 002104), approx. 1km to the south;
- Moyclare Bog SAC/pNHA (Site Code: 000581), approx. 4.8km to the west;
- Clonydonnin Bog NHA (Site Code: 000565), approx. 2.7km to the north;
- Doon Esker Wood pNHA (Site Code: 001830), approx. 4.2km to the northwest; and,
- Clonlyon Glebe Bog pNHA (Site Code: 000893), approx. 3.9km to the west.

The TDR works areas at Kennedy's Cross are not located within any designated site. The closest mapped designated site is the Woodville Woods pNHA (Site Code: 00927) which is located 14m from the TDR accommodation areas to the west of the N62 national road.

8.3.9 Peat Stability Assessment

8.3.9.1 Introduction

Fehily Timoney and Company (FTC) was engaged to undertake a geotechnical and peat stability of the Proposed Project site. A PSRA (FTC, 2025) is attached in Appendix 8-1.

Hydrological, hydrogeological and ecological factors were also assessed in the PSRA, with continuous engagement and consultation between FTC, HES and MKO were undertaken throughout the iterative design process. The assessment was done in accordance with Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, Scottish Government, 2017).

A constraints study was initially undertaken by the Environmental (MKO), Hydrological (HES) and Ecological (MKO) members of the project design team to determine the developable area at the site, prior to the site reconnaissance by engineering geologists/geotechnical engineers from FTC.

8.3.9.2 Hydrological Considerations

The hydrological factors with regard to peat stability were assessed using a combination of desk study data, aerial photography (historical and contemporary), topographic lidar data flow path drainage analysis, site walkovers, field drainage mapping and gouge coring. Detailed drainage maps were prepared along with hydrological constraints mapping for on-site drainage features and wet areas.

Many of the Pre-conditions as described by PLHRAG are hydrological in nature and are listed in the guidance as follows:

- Impeded drainage caused by a peat layer overlying an impervious clay or mineral base (hydrological discontinuity, especially an iron pan at the base of the peat deposit);
- A convex slope or a slope with a break of slope at its head (concentration of subsurface flow);
- Proximity to local drainage, either from flushes, pipes or streams (supply of water); and,
- Connectivity between surface drainage and the peat/impervious interface (mechanism for generation of excess pore pressures).

Identifying the above Pre-conditions at the site was a key part of the hydrological constraints assessment carried out in conjunction with the Proposed Project design team.

8.3.9.3 Peat Slides – Lessons Learned

The PSRA (FT, 2025) has been undertaken taking into account peat failures that have occurred on peatland sites (such as recent failures at Shass Mountain 2020, Co. Leitrim and Meenbog 2020, Co. Donegal). The lessons learned from both peat slide events have been incorporated into the design of the Proposed Project and the construction methodologies to be implemented.

The peat present on the Proposed Project is cutover raised bog which has been historically used for industrial scale peat extraction. The site is flat in nature, and the areas where peat has been extracted have been drained to locally lower the water level within the peat. This has led to an increase in the strength of the in-situ peat when compared to undrained areas. Given the flat nature of the Proposed Project site and the higher strength of the peat, the site conditions at the Proposed Project are not considered to be similar to Shass Mountain or Meenbog, nor is it considered likely that a similar failure could occur at Lemanaghan.

It is also noted that there have been numerous wind farms successfully constructed on raised bog sites over the past 15 years with any issues relating to peat failure, such as Derrinlough (Co. Offaly), Galway Wind Park and Arderroo Wind Farm (both Co. Galway).

8.3.9.4 Peat Stability – Desk Study

BnM records do not document the occurrence of any historic landslides at the Proposed Project site. Similarly, the GSI's online database (www.gsi.ie) does not report any historic landslides within the Proposed Project site or in the surrounding lands. The closest GSI mapped landslide event, dated from 1954, is near Derries Bridge on Pollagh Bog, approximately 3km south of the Proposed Project site.

The GSI Landslide Susceptibility Map (www.gsi.ie) classifies the probability of a landslide occurring at the Proposed Project site as 'Low'. This is due to the sites lowland setting and flat topography. Peat failures and landslides are more likely to occur in upland setting where there is sloping ground and high rainfall rates.

8.3.9.5 Geotechnical Peat Stability Risk Assessment

FTC completed a peat stability analysis at all the main infrastructure locations across the Proposed Project site as for both the undrained and drained conditions. The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes. The minimum required Factor of Safety (FoS) is 1.3 based on BS6031:1981: Code of Practice for Earthworks (BSI, 2009). The assigned probability of instability associated with a given FoS value is described in Table 8-7.

Table 8-7: Probability Scale for Factor of Safety for Peat

Scale	Factor of Safety	Probability
1	1.30 or greater	Negligible/None
2	1.29 to 1.20	Unlikely
3	1.19 to 1.11	Likely
4	1.01 to 1.10	Probable
5	<1.0	Very Likely

8.3.9.5.1 Peat Stability Assessment Results

Stability of a peat slope is dependent on several factors working in combination. The main factors that influence peat stability are slope angle, shear strength of peat, depth of peat, pore water pressure and loading conditions.

An adverse combination of factors could potentially result in peat sliding. An adverse condition of one of the above-mentioned factors alone is unlikely to result in peat failure. The infinite slope model (Skempton and DeLory, 1957) is used to combine these factors to determine a factor of safety for peat sliding. This model is based on a translational slide, which is a reasonable representation of the dominant mode of movement for peat failures.

To assess the FoS for a peat slide, an undrained (short-term stability) and drained (long-term stability) analysis has been undertaken to determine the stability of the peat slopes on site.

- The undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.
- The drained loading condition applies in the long-term. The condition examines the effect of in particular, the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes.

As mentioned above, the PSRA (FTC, 2025) is attached in Appendix 8-1.

Undrained Analysis

The results of the undrained analysis for peat at the proposed infrastructure locations are presented in Table 8-8. The analysis was done for 2 no. conditions: Condition 1 with no surcharge loading and Condition 2 with a surcharge of 10kPa, equivalent to 1m of stockpiled peat. As outlined above the undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.

The calculated FoS for Condition 1 is in excess of 1.30 for all of the key infrastructure locations and across the 281 no. locations subject to the analysis. The calculated FoS for Condition 1 was found to range from 2.44 to 21.56, indicating a low risk of peat instability.

The calculated FoS for Condition 2 is in excess of 1.30 for all key infrastructure locations and across the 281 no. locations subject to the analysis. The calculated FoS for Condition 2 was found to range from 2.01 to 6.88, indicating a low risk of peat instability.

Table 8-8: Factor of Safety Results (undrained condition)

Infrastructure Element	Easting	Northing	Factor of Safety for Load Condition[2]	
			Condition (1)	Condition (2)
T01	614198	727373	3.19	2.5
T02	614481	726939	5.07	3.19
T03	614779	726516	3.92	2.69
T04	615978	727580	21.56	6.16
T05	615647	727935	8.83	4.99
T06	615647	727935	7.17	5.06
T07	614968	727549	4.25	3.1
T08	615375	728345	4.79	3.08
T09	616021	728746	6.75	4.25
T10	615717	729399	4.31	2.87
T11	616379	729349	6.75	4.25
T12	616415	728161	11.47	6.88
T13	616995	728608	4.31	2.87
T14	617357	728184	6.63	3.75
T15	617684	728906	2.8	2.25
Met Mast	614131	727021	6.38	4.1
Substation	614953	730887	2.44	2.01
Temporary Construction Compound 1	612542	727781	2.73	2.21
Temporary Construction Compound 2	617278	728493	5.22	3.59
Temporary Construction Compound 3	614686	727316	2.97	2.21
Temporary Construction Compound 4	615684	729778	3.13	2.65

[2] *For the stability analysis two load conditions were examined, namely*

Condition (1): *no surcharge loading – natural peat slopes*
Condition (2): *surcharge of 10 kPa, equivalent to 1 m of stockpiled peat assumed under a precautionary scenario.*

Infrastructure Element	Easting	Northing	Factor of Safety for Load Condition[2]	
			Condition (1)	Condition (2)
Temporary Construction Compound 5	614958	730828	2.50	2.05

Drained Analysis

Drained analysis results are presented in Table 8-9. Similar to the undrained analysis, the drained analysis was done for 2 no. conditions: Condition 1 with no surcharge loading and Condition 2 with a surcharge of 10kPa, equivalent to 1m of stockpiled peat. As outlined above, the drained loading condition applies in the long-term. The condition examines the effect of in particular, the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes.

The calculated FoS for Condition 1 was in excess of 1.30 at all key infrastructure locations (and at all of the 281 no. locations subject to the analysis). The FoS ranged from 2.13 to 21.04, indicating a low risk of peat instability.

The calculated FoS for Condition 2 was in excess of 1.30 at all key infrastructure locations (and at all of the 281 no. locations subject to the analysis). The FoS ranged from 3.6 to 17.94, indicating a low risk of peat instability.

Table 8-9: Factor of Safety Results (drained condition)

Infrastructure Element	Easting	Northing	Factor of Safety for Load Condition[3]	
			Condition (1)	Condition (2)
T01	614198	727373	2.13	3.6
T02	614481	726939	10.05	8.8
T03	614779	726516	9.28	8.46
T04	615314	727112	21.04	10.77
T05	615978	727580	14.78	12.23
T06	615647	727935	18.13	16.73
T07	614968	727549	11.73	10.97
T08	615375	728345	9.86	8.72
T09	616021	728746	13.4	11.73
T10	615717	729399	9.54	8.56
T11	616379	729349	13.4	11.73

[3] *For the stability analysis two load conditions were examined, namely*

Condition (1): *no surcharge loading*
Condition (2): *surcharge of 10 kPa, equivalent to 1 m of stockpiled peat assumed under a precautionary scenario.*

Infrastructure Element	Easting	Northing	Factor of Safety for Load Condition[3]	
			Condition (1)	Condition (2)
T12	616415	728161	21.0	17.94
T13	616995	728608	9.54	8.58
T14	617357	728184	11.09	9.17
T15	617684	728906	10.76	10.4
Met Mast	614131	727021	13.15	11.63
Substation	614953	730887	10.53	10.24
Construction Compound 1	612542	727781	8.97	8.31
Construction Compound 2	617278	728493	12.38	11.29
Construction Compound 3	614686	727316	8.65	8.14
Construction Compound 4	615684	729778	15.44	15.12
Construction Compound 5	614958	730828	9.69	8.65

8.3.9.5.2 *Conclusions*

The findings of the PSRA showed that the Proposed Project site has an acceptable margin of safety, is suitable for development of the Proposed Project and is considered to be at low risk of peat failure. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

8.3.10 Receptor Sensitivity and Importance

Based on the criteria set out in Table 8-2 above, the soils/subsoils at the Proposed Project site can be classed as being of 'Low' importance as the soils in this area are not designated. Furthermore, the peat soils and subsoils within the site have been degraded by the historic peat extraction activities and associated drainage works which commenced at the Proposed Project site in 1950 and ceased in June 2020. The bedrock geology underlying the Proposed Project site can be classed as being of 'Medium' importance where the bedrock could be used on a sub-economic scale.

The land, soils/subsoils and bedrock geological formations underlying the Proposed Project site will be included in the impact assessment due to their proximal location to the Proposed Project and the potential direct effects that the Proposed Project may have on these receptors.

Furthermore, the Clonmacnoise Esker CGS will be included in the impact assessment due to the overlap between the Proposed Project site and the mapped extent of this CGS.

All other geological heritage sites and designated have been screened out of the impact assessment due to their distant location from the Proposed Project site. There is no potential for effects to occur on these geological heritage sites or designated sites.

8.4 Characteristics of the Proposed Project

The Proposed Project comprises of both the Proposed Wind Farm and the Proposed Grid Connection.

In summary, the Proposed Wind Farm consists of 15 no. wind turbines and associated infrastructure including hardstands, 1 no. meteorological mast, 5 no. temporary construction compounds, 4 no. borrow pits, 3 no. permanent amenity carparks, approximately 20.8km of new road (including new amenity track), the upgrade of approximately 3km of existing road (including that for the purposes of amenity), felling of immature woodland (1.02ha), proposed biodiversity enhancement measures, and all associated development and drainage works. The Proposed Grid Connection comprises of a 220kV electricity substation, control buildings, approximately 0.8km of overhead line (0.4km of double looped OHL), 4 no. new steel masts, 2 no. gantry structures and a temporary access track. Please refer to Chapter 4 for a full description of the Proposed Project.

FTC have prepared a Peat and Spoil Management Plan (2026) which describes how peat and spoil, which will be excavated from infrastructure locations, will be handled and placed/reinstated onsite. The Peat and Spoil Management Plan is attached as Appendix 4-3. The main characteristics of the Proposed Project that could affect the local soils and geological environment are described below:

- Opening of the 4 no. borrow pits, which will involve the stripping of ~15,587m^3 of peat and ~159,522m^3 of spoil (non-peat) (FTC, 2026). Rock extraction and subsequent processing of suitable rock to create aggregate for use on site in access tracks and hardstand construction.
- The establishment of the 5 no. temporary construction compounds will be constructed using the floated technique. No peat or spoil excavations will be required. Welfare facilities will be provided at the site compounds. Wastewater effluent will be collected in a wastewater holding tank and periodically emptied by a licensed contractor.
- Construction of the proposed onsite 220kV substation will be completed using piled foundations. The substation construction will require the excavation of ~12,170m^3 of peat and 3,651m^3 of non-peat (spoil) material (FTC, 2026). Welfare facilities will be provided at the proposed onsite 220kV substation. Wastewater effluent will be collected in an underground concrete holding tank and periodically emptied by a licensed contractor for the operational phase of the Proposed Project.
- The upgrade of existing internal roads and the construction of new internal roads will require the removal of ~9,790m^3 of peat and 37,456m^3 of non-peat material (FTC, 2026). Due to the peat depth at the Proposed Project site, internal roads will generally be constructed using the floated technique (~12.1km) (including for amenity). The methodology includes the placement of a geotextile membrane on both sides of the existing access track. Benching of the existing road and placement of granular fill. Overlay existing road with granular fill and new access road to be finished with a layer of capping. No peat extraction will be required in the upgrade of existing floated access roads and/or construction of new floating roads. The upgrade and construction of these tracks will require the use of Class 6 crushed stone and general fill. It is also proposed to construct ~9.3km of new excavated roads (included for amenity).
- Construction of the turbine hardstands and 15 no. turbines will require the removal of approximately 158,466m^3 of peat and 25,535m^3 of spoil (FTC, 2026). The construction will also involve the use of aggregate, sourced from the onsite borrow pits. Turbine foundations may be constructed using gravity or piled foundations, depending on the residual peat depth at each location.
- The construction of the met mast is estimated to require the excavation of approximately 2,063m^3 of peat and 248m^3 of spoil (FTC, 2026). The met mast foundation will likely comprise gravity type foundation, with the foundation to be founded on a competent stratum below the peat.

- The construction of the proposed Telecoms Tower will be completed using a piled foundation and will require excavation of 248m^3 of peat and 74m^3 of spoil material.
- The construction of the steel masts and associated hardstand areas for the OHL, and the associated crane pads, will be completed using a mixture of gravity and piled foundations and will require the excavation of peat and spoil.
- Peat generated by construction will be reused or reinstated and will be available to be used for landscaping on edges of constructed infrastructure. As part of the Construction and Environmental Management Plan (CEMP) (Appendix 4-4), it is proposed to place the excavated peat and spoil in the 2 no. peat deposition areas and 4 no. borrow pits.

Summary volumes of material to be excavated are provided in The excavated peat will be used during decommissioning as detailed in Section 8.5.4.

Table 8-10.

As detailed above, the total volume of peat requiring management on site is estimated to be 207,527m^3. Peat material will be stored in the Peat Deposition Areas (PDAs) which have a capacity of 175,00m^3. Excess peat and spoil will also be placed in the 4 no. borrow pits, sidecast along access roads or used for landscaping. Table 8-10 below provides a summary of the potential peat and spoil deposition areas at the Proposed Project site. The borrow pits and PDAs have enough storage capacity for all the peat and spoil excavated from the site, however landscaping and site-casting have been included to reduce the movement of materials. Therefore, there is more than sufficient storage capacity to manage all peat and spoil generated within the site. No material will need to be transported to or from the site outside of the engineering fill and high-quality, surface granular fill and sand which will be sourced from local quarries. Note that the total storage volume of 824,310m^3 is the maximum storage capacity and that the borrow pits will only be partially backfilled to the required depth based on the peat and spoil generated during construction and will not be backfilled to the original ground surface. The excavated peat will be used during decommissioning as detailed in Section 8.5.4.

Table 8-10: Estimated Peat, Mineral Soil and Bedrock Excavation Volumes at the Proposed Project site

Infrastructure Element (1)	Typical Dimensions	Peat Volume (m^3) (2)	Spoil (non-peat) Volume (m^3) (2)	Comments
15 no. Turbines and Hardstands	28m diameter excavation footprint for turbine foundation with 49 x 75m hardstand area.	158,466	25,535	Hardstanding area and foundation footprint
Internal Roads	Assumed 5m running surface with 6m wide development footprint.	9,790	37,456	Excludes proposed floating sections of access road where no excavation of peat will take place
Substation	11,064m^2 footprint	12,170	3,651	Piled foundation
Meteorological Mast	12 x 12m foundation footprint and	2,063	248	Assumes gravity foundation

Infrastructure Element (1)	Typical Dimensions	Peat Volume (m^3) (2)	Spoil (non-peat) Volume (m^3) (2)	Comments
	40 x 40m hardstanding area			
5 no. Temporary Construction Compounds	Hardstanding area – 57,397m^2	0	0	Floating compounds
Telecoms Tower	15m x 15m footprint	248	74	Assumes piled foundation
Steel Masts (OHL) north of substation	2 no. masts – 20 x 20m and 3m deep foundation	3,390	282	Assumes gravity foundation
Steel Masts (OHL) – under OHL	2 no. masts with 20 x 20m and 3m deep foundation	753	2,636	Assumes gravity foundation
Crane Pad for Steel Mast OHL (north of substation)	30 x 30m	990	297	Founded foundations
Crane Pad for Steel Masts OGL (under OHL)	30 x 30m	990	297	Founded foundations
Tower Building (north of substation)	56 x 25m	1,540	462	Piled foundation
Tower Building (under OHL)	56 x 25m	1,540	462	Piled foundation
4 no. Borrow Pit	4 no.	15,587	159,522	-
Total		207,527m^3	230,922m^3	
Total (Peat and Spoil)		438,449m^3		

Note (1) The location of the infrastructure elements on-site are shown on Planning Drawings.
Note (2) A factor of 10% (bulking factor of 5% and contingency factor of 5%) has been applied to the excavated peat & spoil volumes to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

Table 8-11: Summary of Peat and Spoil Placement Areas at the Proposed Project site

Location	Peat & Spoil Volume (m^3)	Comment
Landscaping	30,000	~2,000m^3 of peat will be required for landscaping at each of the 15 no. turbine locations.
Side Casting	10,710	Side casting will be comprised of peat and spoil placed along access roads.
Borrow Pits	608,600	The borrow pits will be used to store peat and spoil.
Peat Deposition Areas	175,000	These areas will be used for peat storage only.
Total	824,310	

Table 8-12: Summary of Proposed Infrastructure construction methods (PSMP - FTC, 2026)

Location	Foundation/Construction Method
15 no. wind turbines	Foundations for wind turbines may be of the gravity or bored piled type. It should be noted that confirmatory ground investigation will be carried out prior to construction at each proposed turbine location in the form of a borehole with in-situ SPT testing (Standard Penetration Test) at 1.0m intervals in the overburden and follow-on rotary core through bedrock to confirm the foundation types and founding stratums. It is likely that following the completion of further ground investigation prior to construction that a number of the proposed turbine bases will be deemed suitable for gravity type foundations. For gravity type turbine foundations, where the depth of excavation exceeds the required founding depth for the proposed turbine base, up-fill material consisting of granular fill (6N) shall be used to backfill the excavation to the required founding depth. For the piled type turbine foundations, a typical piling type and configuration could be up to 16 no. 1200-1600mm diameter rotary bored piles.
Access roads	Floating access roads are the predominant road construction type proposed for the Proposed Project site. The use of new floated access tracks will be limited on site to areas of flatter terrain with slopes typically less than 5 degrees. The total length of new proposed road to be constructed on-site is approx. 20.8km of which 12.1km of new floating road is proposed (see Peat and Spoil Management Plan, Appendix 4-3).
Crane hardstands	All crane pads will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The crane hardstands will be constructed in a similar manner to the excavated site roads and will measure in accordance with the turbine manufacturer's requirements. Where an excavated crane hardstand cannot be used due to the depth of peat, the hardstand will

Location	Foundation/Construction Method
	be supported by using reinforced concrete piles per the methodology outlined for piled foundations.
Substation foundations and platforms	The substation platform will have a piled foundation due to the depth of peat exceeding 4m. The foundations will require to be founded on glacial till. The peat and lacustrine subsoils will not be a suitable founding stratum. Typical founding depth is likely to be 9 to 11mbgl.
Temporary Construction Compounds	The temporary construction compounds will be constructed using a floated technique. The construction compound platforms are generally constructed using compacted Class 1/6F material on a suitable sub-formation to achieve the required bearing resistance. The construction compound platforms will require to be founded on material underlying the peat deposits. Typical founding depth for construction compound platforms will require excavations from 0.8m to 1.4mbgl.
Met Mast	The met mast foundations will comprise gravity type foundation although a piled foundation may also be suitable. For a gravity foundation the met mast foundation will be founded on a competent stratum below the peat. Typical founding depth for the met mast gravity foundation is envisaged to be 3.2mbgl. At the underside of the met mast foundation, a layer of structural up-fill (class 6N) will be required. Alternatively, for a piled met mast foundation, a typical piling type and configuration could be up to 5 no. 900mm diameter rotary bored piles.

8.5 Likely Significant Effects and Associated Mitigation Measures

8.5.1 Do Nothing Scenario

If the Proposed Project were not to proceed, the Proposed Project site would continue to be managed under the requirements of the relevant IPC licence and therefore the ongoing site management and environmental monitoring would continue.

In the absence of the Proposed Project, natural revegetation processes would continue across the site. Areas of bare peat would progressively revegetate and transition through successional stages, potentially developing into heath communities, scrub or bog woodland over time, depending on local hydrological conditions. Therefore, the existing baseline of the landscape will transition from a predominantly industrial cutover peatland landscape, with open exposed peat surfaces and drainage features, to a more natural mosaic landscape of cutaway peatland, wetland and regenerating bog habitats.

The Proposed Project site is located on lands that are subject to ongoing and future peatland rehabilitation and decommissioning works required under the existing IPC Licence. Therefore, under a 'Do-Nothing' scenario, the implementation of the Draft Rehabilitation Plan as required under IPC License would continue. These rehabilitation works are mandatory and will proceed irrespective of whether the Proposed Project is permitted, in order to ensure compliance with the IPC Licence.

If the Proposed Project were not to proceed, the opportunity to further significantly reduce emissions of greenhouse gases, including carbon dioxide (CO2), oxides of nitrogen (NOx), and sulphur dioxide (SO2) from fossil fuels to the atmosphere would be lost. The opportunity to capture a significant part of

County Offaly's and Ireland's valuable renewable energy resources would be lost, as would the opportunity to contribute to meeting Government and EU Targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment and to diversify the local economy would also be lost.

8.5.2 Construction Phase - Likely Significant Effects and Mitigation Measures

The likely significant effects of the construction phase of the Proposed Project and mitigation measures that will be put in place to eliminate or reduce these are detailed in this section. It should be noted that the main potential effects on the soils and geology environment will occur during the construction phase. The assessment considers the Proposed Project as a whole *i.e.* both the Proposed Wind Farm and the Proposed Grid Connection. Where this is required to be assessed separately, this is noted in the text.

8.5.2.1 Potential Effects on Land and Land-use

The Proposed Project includes the construction of 15 no. turbines, associated hardstand areas, 5 no. temporary construction compounds, 4 no. borrow pits, TDR accommodation areas, new internal roads, amenity tracks, upgrades to existing roads and the construction of the Proposed Grid Connection infrastructure. The Proposed Project has a total permanent development footprint of 34.3ha.

In addition, a total of 1.02ha of immature woodland will be permanently felled across the Proposed Project site to facilitate the proposed infrastructure.

The permanent footprint of the Proposed Project will result in the permanent loss of cutover bog and immature woodland which will be replaced by turbine foundations, hardstand areas, access roads and other related infrastructure. The Proposed Project construction works will also result in local topographic changes with the removal of overburden and bedrock.

There will be no effects on the land or land-use adjoining the Proposed Project site.

Pathway: Construction land-take.

Receptor: Land and Land-use (*i.e.* the land upon which the Proposed Project will occur).

Potential Pre-mitigation Effect: Negative, moderate, direct, likely, long-term effect on land and land-use at the Proposed Project site.

Impact Assessment/Mitigation Measures:

The loss of 34.3ha of land (cutover peat bog and agricultural land) resulting from the Proposed Project on a local or a regional scale is minimal and therefore the effects of actual land loss is deemed to not be significant.

The loss of 34.3ha represents ~3% of the Proposed Project site (1,258ha).

No specific mitigation is proposed in regard to land loss as this is considered to be an acceptable consequence of the Proposed Project.

The total amount of immature woodland to be removed (1.02ha) accounts for only 0.08% of the Proposed Project site. All vegetation loss will be replaced within the site as part of the measures outlined in the Biodiversity Management and Enhancement Plan (BMEP) (Appendix 6-5). Therefore, there will be no net loss of immature woodland at the Proposed Project site.

Residual Effect Assessment: Due to the relatively small footprint of the Proposed Project infrastructure on a site scale and even more so on a local scale the residual effect is considered to be a negative, direct, moderate, likely, long-term effect on land and land-use.

Significance of Effects: For the reasons outlined above, no significant effects on land or land-use will occur.

8.5.2.2 Potential Effects from Peat and Subsoil Excavation

Excavation of peat and subsoil will be required for the installation of access roads (floating and excavated roads), gravity foundations for turbine bases, crane hardstands, met masts, proposed onsite 220kV substation, internal cable network, biodiversity enhancement measures etc. The estimated volumes of peat and subsoils to be relocated are summarised above in The excavated peat will be used during decommissioning as detailed in Section 8.5.4.

Table 8-10. The total combined volume of peat and spoil requiring excavation is estimated to be 438,449m^3. It is noted that earthworks of this type, scale and magnitude have been granted permission and successfully completed at similar sites around the country.

However, there will be no loss of spoil from the Proposed Project site, as it will be relocated and stored within the proposed onsite borrow pits, in the designated peat deposition areas and will be used in landscaping at the turbine locations or in linear berms (side cast) along access roads where appropriate. Excavated spoil material can also be reused as fill material. Table 8-11 demonstrates that there is sufficient capacity to store all excavated peat and spoil at the Proposed Project site.

Pathway: Excavation/extraction.

Receptor: Peat and subsoil.

Potential Pre-mitigation Effect: Negative, moderate, direct, likely, permanent effect on peat and spoil due to relocation within the Proposed Project site.

Proposed Mitigation Measures by Design:

- Placement of turbines and associated infrastructure in areas with shallower peat where constraints allow;
- Use of floating roads, where appropriate, to reduce peat excavation volumes;
- The peat and subsoil which will be removed during the construction phase will be localised to the wind farm infrastructure such as turbine location, substation and temporary compounds and access roads and kept on site;
- The Proposed Project has been designed to avoid sensitive habitats within the site;
- A minimal volume of peat and subsoil will be removed to allow for infrastructural work to take place in comparison to the total volume present on the site due to optimisation of the layout by mitigation by design;
- Excavated peat will be moved short distances from the point of excavation, side cast and/or will be used locally for landscaping;
- Excavated peat that is not used locally for landscaping will be stored in the 4 no. borrow pits or in the designated peat deposition areas; and,
- Construction of settlement ponds will be volume neutral, and all excess material will be used locally to form pond bunds and surrounding landscaping.

Residual Effect Assessment: The granular soil at the Proposed Project site can be classified as of "Medium" importance whilst the peat deposits can be classified as of "Low" importance as the raised bog is already degraded by historical peat harvesting and drainage. The overall Proposed Project site area is extensive while the Proposed Project infrastructure footprint is ~3% of the overall site area. The impact is the disturbance and relocation of ~438,449m^3 of peat and spoil during construction. The

design measures incorporated into the Proposed Project as described above in particular the avoidance of deeper peat areas combined with the 'Medium' and 'Low' importance of the deposits means that the residual effect is considered to be a Negative, slight, direct, likely, permanent effect on peat and subsoils due to disturbance and relocation within the site.

Significance of Effects: For the reasons outlined above, no significant effects on soils and subsoils will occur.

8.5.2.3 Potential Effects from Leakages and Spillages

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a pollution risk at the Proposed Project site. The accumulation of small spills of fuels and lubricants during routine plant use can also be a significant pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. Large spills or leaks have the potential to result in significant effects (i.e. contamination of soils, subsoils and pollution of the underlying aquifer) on the geological and water environment, depending on where a spill may occur.

Pathway: Peat, subsoil and underlying bedrock pore space.

Receptor: Peat, subsoil and bedrock at the Proposed Project site.

Potential Pre-Mitigation Effect: Negative, slight, direct, short-term, unlikely effect on peat, subsoils and bedrock.

Proposed Mitigation Measures:

- Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Where possible, off-site refuelling will occur at a controlled fuelling station;
- On-site re-fuelling will be undertaken using a double skinned bowser or a refuelling truck with spill kits kept onboard;
- Only designated trained operatives will be authorised to refuel plant on-site;
- Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system;
- All fuel storage areas will be bunded appropriately for the duration of the construction phase. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- The proposed onsite 220kV substation will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency response plan for the construction phase to deal with accidental spillages is contained within the CEMP (which is contained in Appendix 4-4).

Residual Effect Assessment: The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect is considered to be a negative, imperceptible, direct, short-term, unlikely effect on peat, subsoils and bedrock.

Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation, no significant effects on soils, subsoils and bedrock will occur.

8.5.2.4 Potential Effects from the Erosion of Exposed Subsoils and Peat

Erosion of soil/subsoil by the pathways listed below, can have the effect of reducing the overall volume of soil/subsoil at the Proposed Project site, with the potential for some eroded subsoils to reach watercourses, leading to water quality issues such as high turbidity. Erosion of soils/subsoils may occur at any works area where excavation is ongoing i.e., turbine foundations, access roads and immature woodland felling areas within the Proposed Project site.

The main effects associated with this aspect are related to the water environment, and therefore this aspect is further assessed in detail in Chapter 9: Water.

Pathway: Vehicle movement, surface water and wind action.

Receptor: Peat and subsoil.

Potential Pre-Mitigation Effect: Negative, slight, direct, short-term, likely effect on peat and subsoils by erosion and wind action.

Proposed Mitigation Measures:

- All works will be completed in accordance with the Peat and Spoil Management Plan (Appendix 4-3);
- All excavated peat and spoil shall be transported immediately on excavation to designated peat storage areas along the access roads and will be used on site for landscaping close to the extraction area;
- Where peat/spoil is not used to landscaping it will be transported immediately to one of the proposed borrow pits or PDAs;
- Peat and spoil will not be transported significant distances upon excavation;
- Upon excavation, the upper vegetative layer (where still present) will be stored with the vegetation part of the sod facing the right way up to keep the plants and vegetation alive to aid construction reinstatement of disturbed ground; and,
- Re-seeding and spreading/planting will also be carried out in areas where ground will be disturbed.

Residual Effect Assessment: Peat soils and spoil can be eroded by vehicle movements, wind action and by water movement. To prevent this all excavation works will be completed in accordance with the detailed Peat and Spoil Management Plan. Material will be moved the shortest possible distances, and reseeding and planting will be completed to bind landscaped peat and spoil together. Following implementation of these measures the residual effected is considered to be a negative, imperceptible, direct, short-term, likely effect on peat and subsoils by erosion and wind action.

Significance of Effects: For the reasons detailed above, and the with implementation of the prescribed mitigation measures, no significant effects on peat or subsoils will occur.

8.5.2.5 Potential Effects from the Excavation of Proposed Borrow Pits

The excavation of ~15,587m^3 of peat and ~159,522m^3 of spoil (non-peat) will be completed at 4 no. proposed borrow pits. Once the overlying peat has been removed material will be excavated from the borrow pits to facilitate the construction of the Proposed Project. The total stone requirements for the construction of the Proposed Project is estimated to be 414,990m^3 (which includes a 15% contingency).

Pathway: Extraction/excavation.

Receptor: Peat and subsoil.

Potential Pre-Mitigation Effect: Negative, moderate, direct, likely, permanent effect on peat and subsoil due to relocation within the Proposed Project site.

Proposed Mitigation Measures by Design:

The Peat and Spoil Management Plan (FTC, 2026) attached as Appendix 4-3 sets out the guidelines for the construction and reinstatement of the on-site borrow pits. Upon the removal of the required volumes of material (for the construction of the infrastructure elements at the wind farm) from the borrow pits it is proposed to reinstate the pits using excavated peat and spoil. The borrow pits are designed and will be constructed in a way which will allow the excavated peat and spoil to be placed safely, with areas within the borrow pits designated for the storage of excavated peat.

The 4 no. borrow pits will be excavated and backfilled as follows:

- The rock within the proposed borrow pit footprints will be removed by breaking based on assessment of its excavatability, which has been determined from a ground investigation carried out at the proposed borrow pits.
- It is proposed to construct the borrow pits so that the base of the borrow pits are below the level of the adjacent section of internal road. As excavation progresses into the back edge of the borrow pits, localised deepening of the borrow pit floors may be required depending on extraction operations.
- It may be possible to excavate the rock from the borrow pits whilst leaving in place upstands/segments of intact rock which will retain the placed peat and spoil in individual cells. The upstands/segments of intact rock will essentially act as engineered rock buttresses within the borrow pits, forming a series of cells (up to 4 no.). The cells will be opened in sequence and filled as needed.
- Slopes within the excavated rock formed around the perimeter of the borrow pits will be formed at stable inclinations to suit local in-situ rock conditions. Exposed sections of the rock slopes will be left with irregular faces and declivities to promote re-vegetation and provide a naturalistic appearance.
- Where it is not possible to leave upstands/segments of intact rock in place it will be necessary to construct rock buttresses founded on in-situ rock within the borrow pits to create individual cells. The rock buttresses will be constructed of rock fill from the borrow pit excavation, placed and compacted in layers. The founding stratum for each rock buttress will be inspected and approved by The Project Geotechnical Engineer.
- The rock buttresses will be constructed in stages to allow infilling of peat and spoil within cells. The buttress shall be constructed of selected rock fill and placed and compacted in suitable layers to form a buttress of sufficient stability to retain the placed peat and spoil.
- Infilling of the peat and spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress, leaving in place upstands/segments of intact rock which will help to retain the placed peat spoil and

will allow the borrow pit to be developed and infilled in cells. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be reinstated safely.

- A number of rock buttresses to form cells within the borrow pits will be required to ensure access for trucks and excavators can be achieved.
- The rock buttresses shall be wide enough (up to 4m) to allow construction traffic access for tipping and grading during the placement of the excavated peat and spoil. The permanent side slopes of the rock buttress shall be constructed between 40 to 60 degrees.
- A rock buttress will be required on the downslope side of the borrow pits to safely retain the infilled peat and spoil. The height of the berm constructed will be greater than the height of the reinstated peat and spoil to prevent any surface peat and spoil run-off. A berm up to 8m (max.) in height will be required.
- The rock buttress will be founded on mineral soil or bedrock i.e. competent strata. The founding stratum for the rock buttress will be inspected and approved by the Project Geotechnical Engineer.
- A level surface in the underlying mineral soil or Weathered Bedrock will be prepared before placing and compacting the rock fill used to construct the berms.
- The use of temporary access ramps and long reach excavators during the placement of the excavated peat and spoil is likely to be required.
- The surface of the placed peat and spoil shall be shaped to allow efficient run-off of surface water from the placed arisings.
- As the berms are slightly higher than the retained peat, drains will be provided at regular intervals through the berms, at the same level as the top of the peat surface, to prevent ponding of water around the edges of the repositories. These drains will be 150mm diameter flexible plastic drainage pipe or equivalent.
- A layer of geogrid to strengthen the surface of the placed peat and spoil within the borrow pits may be required.
- The acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat and spoil within the borrow pits.
- Supervision by the Project Geotechnical Engineer is required for the development of the borrow pits.
- All the above-mentioned general guidelines and requirements will be implemented by the Contractor during construction.

Residual Effect Assessment: The effect is the disturbance of ~15,587m^3 of peat and ~159,522m^3 of spoil during construction and the relocation of spoil. The design measures as described above in particular the avoidance of deeper peat areas combined with the 'Medium' and 'low' importance of the deposits means that the residual effect is considered to be a negative, slight, direct, likely, permanent effect on peat and subsoils due to disturbance and relocation within the Proposed Project site.

Significance of Effects: For the reasons detailed above, and with the implementation of the listed mitigation measures, no significant effects on soils and subsoils will occur as a result of the proposed borrow pit excavations.

8.5.2.6 Potential Effects from Peat Instability and Failure

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on a proposed wind farm development and the surrounding environment. The potential significant effects of peat failure at the study area may result in:

- Death or injury to site personnel;
- Damage to machinery;
- Damage or loss of infrastructure;
- Drainage disruption by blockage of drainage pathway by relocated peat and spoil;
- Site works damaged or unstable;
- Contamination of watercourses, water supplies by particulates; and,
- Degradation of the peat environment by relocation of peat and spoil.

Pathway: Vehicle movement and excavations.

Receptor: Peat and subsoils.

Potential Pre-Mitigation Effect: The findings of the peat stability assessment showed that the Proposed Project site has an acceptable margin of safety, is suitable for development of the Proposed Project and is considered to be at low risk of peat failure. The findings include recommendations and control measures for construction work in peatlands to ensure that all works adhere to an acceptable standard of safety. The pre-mitigation potential effect is considered to be a negative, significant, direct, permanent, unlikely effect on peat and subsoils.

Proposed Mitigation Measures:

The following general control measures incorporated into the construction phase of the Proposed Project will assist in the management of the risks for this site:

- Appointment of experienced and competent contractors;
- The site should be supervised by experienced and qualified personnel;
- Allocate sufficient time for the construction of the Proposed Project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement);
- Prevent undercutting of slopes and unsupported excavations;
- Maintain a manage a robust drainage system;
- Prevent placement of loads/overburden on marginal ground;
- Set up, maintain and report findings from monitoring systems (as outlined in the PSRA);
- Ensure construction method statements are developed and agreed before commencement of construction and are followed by the contractor; and,
- Revise and amend the Construction Risk Register as construction progresses to ensure that risks are managed and controlled for the duration of construction.

Please refer to Section 4.4.1 of Chapter 4 for proposed turbine specifics and road section design proposals.

Residual Effect Assessment: A detailed Geotechnical and Peat Stability Assessment (FTC, 2025) (Appendix 8-1) has been completed for the Proposed Project. The findings of that assessment have demonstrated that there is a low risk of peat failure (at the site) as a result of the Proposed Project once the recommended mitigation measures are implemented. With the implementation of the prescribed control measures the residual effect is considered to be a negative, imperceptible, direct, unlikely, permanent effect on peat and subsoils.

Significance of Effects: For the reasons detailed above, and with the implementation of the prescribed mitigation measures, no significant effects on soils and subsoils will occur.

8.5.2.7 Potential Effects from Piling Works

Due to the depth of peat, it is anticipated that the majority of the proposed turbines and infrastructure locations will require piled foundations.

For the piled turbine foundations, a piling type and configuration could be up to 16 no. 1,200mm square concrete driven piles. A similar type pile and configuration was used for the turbine foundations on the Ballivor Wind Farm (ABP Ref: 305992-19), Co. Meath and Westmeath. Proposed foundation and pile configurations are detailed in Chapter 4: Description of the Proposed Project. Piling foundations will also be required for the construction of the proposed onsite 220kV substation and the met mast.

The potential effects associated with the driving of piles relate to peat/subsoil compaction and displacement in the area of the proposed works.

Pathway: piling works.

Receptor: peat/soils and subsoils.

Potential Pre-Mitigation Effect: Negative, slight, direct, permanent unlikely effect on peat/subsoils by piling works.

Proposed Mitigation Measures:

Other than surface level and minor excavation works, any driven piles will not produce significant volumes of spoil, these will displace soil/subsoil within the ground.

The bored pile option could produce between 230 to 410m^3 of spoil material per turbine base. Excess spoil will be removed for permanent storage in the on-site borrow pits, side cast or PDA. Bored pile spoil volumes only amount to between ~1 to 1.5% of the overall peat and spoil volumes for the Proposed Project.

No mitigation measures are proposed or required for soils and geology environment. Proposed mitigation to protect the water environment are outlined in Chapter 9: Water.

Residual Effect Assessment: The effect of piling works on soils and geology have been assessed. Driven pile install works would result in small volumes of spoil, and minimal displacement of in-situ peat and subsoils. This small displacement would not alter ground levels, nor change the local geological environment in any significant way. For the bored pile options, spoil will be removed for permanent storage in the on-site borrow pits, side cast or PDA. As such the residual effects are considered to be a negative, direct, slight, permanent, unlikely effect on peat and subsoils by piling works.

Significance of Effects For the reasons detailed above, and with the implementation of the proposed mitigation measures, no significant effects on peat, soils/subsoils and bedrock will occur for Piling Works.

8.5.2.8 Potential Effects on Geological Heritage Sites

The Clonmacnoise Esker CGS is mapped within the Proposed Project site. Any construction works which overlap with the mapped extent of this CGS could result in a direct effect on the CGS.

However, Clonmacnoise Esker CGS is an extensive site, described in the Offaly County Geological Site Report as being an "exceptionally large accumulation of sands and gravels". The esker forms part of the larger Ballinasloe-Split Hills-Clonmacnoise-Clara Esker System, which extends from Galway, through Offaly, and into Westmeath. Therefore, given the scale of the CGS and the wider esker system in comparison to the scale of the Proposed Project there is no potential for significant effects to occur.

Furthermore, the only works proposed within the mapped extent of the CGS relate to the upgrade of approximately 15m of existing road. This existing road extends southwards from the L7001, which also runs through the esker.

Nevertheless, the Proposed Project has been designed to minimise the works within the mapped extent of the CGS.

This removes the potential for any effects on the Clonmacnoise Esker CGS.

Pathway: Damage by vehicular/machinery movement.

Receptor: Clonmacnoise Esker CGS.

Potential Pre-Mitigation Effect: No potential for effects on the Clonmacnoise Esker CGS.

Proposed Mitigation Measures:

No mitigation measures are required.

The only works within the CGS relate to the upgrade of an existing road.

Residual Effect Assessment: There is no potential for residual effects on the Clonmacnoise Esker CGS.

Significance of Effects No significant effects will occur on the Clonmacnoise Esker CGS.

8.5.2.9 Potential Effects Associated with the Proposed Onsite 220kV Substation

As presented in The excavated peat will be used during decommissioning as detailed in Section 8.5.4.

Table 8-10 above the estimated volume of peat and spoil to be excavated at the proposed onsite 220kV substation is 12,170m^3 of peat and 3,651m^3 of spoil. The exact location of the proposed onsite 220kV substation has been selected based on detailed geotechnical investigations and peat stability risk assessments. Material excavated at the proposed onsite 220kV substation will be used for landscaping and the remainder will be permanently stored in low linear sections.

Pathway: Extraction/excavation of peat and soil/subsoils (spoil).

Receptor: Peat and underlying subsoil.

Potential Pre-Mitigation Effect: Negative, moderate, direct, permanent, likely effect on peat and subsoil.

Proposed Mitigation Measures:

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2.
- Mitigation measures in respect of proposed piling works are detailed at Section 8.5.2.7 where the residual effect of all piling works is also assessed.
- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

No additional specific mitigation measures are required.

Residual Effect Assessment: The effect is the disturbance and relocation of peat and spoil during the construction of the proposed onsite 220kV substation and the residual effect of this is considered to be a negative, slight, direct, permanent likely effect on peat and subsoils due to disturbance and relocation within the Proposed Project site.

Significance of Effects: For the reasons detailed above, and with the implementation of the proposed mitigation measures, no significant effects on soils and subsoils will occur.

8.5.2.10 Potential Effects Associated with the Proposed Amenity Track

The Proposed Project includes the upgrade of ~1.14km of existing internal roads and the construction of ~17.1km of new internal roads to be used for maintenance and monitoring as well as for amenity purposes. Furthermore, an additional ~3.9km of new dedicated amenity track will be construction along with a further upgrade of ~1.8km of existing track for the purpose of amenity. It is proposed to construct 3 no. new permanent amenity car parks within the footprint of the proposed temporary construction compounds 1, 3 and 4 (Table 4-2 in Chapter 4).

These pathways will have a gravel/crushed stone finish surface.

The proposed construction methodology for the new tracks and amenity pathways is by floating road construction over the peat or by excavated road construction through peat. Floating roads will be used where possible to minimise the requirement for additional excavation or spoil generation.

Pathway: Extraction/excavation of peat and soil/subsoils (spoil).

Receptor: Peat and underlying subsoil.

Potential Pre-Mitigation Effect: Negative, slight, direct, likely, permanent effect on peat and subsoil.

Proposed Mitigation Measures:

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2.
- Mitigation measures in respect of proposed piling works are detailed at Section 8.5.2.7 where the residual effect of all piling works is also assessed.
- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

No additional specific mitigation measures are required.

Residual Effect Assessment: It is proposed to place amenity pathways on top of existing ground. Ground disturbance and peat and spoil relocation during these works will be minimal. As such the

residual effects of these works are considered - Negative, imperceptible, direct, high probability, permanent effect on peat and subsoils by covering with 3m wide pathway.

Significance of Effects: Fo the reasons detailed above, along with the implementation of the prescribed mitigation measures, no significant effects on soils and subsoils will occur.

8.5.2.11 Proposed Works Associated with TDR Accommodation Areas

Minor temporary haul route works are required at 2 no. locations, listed below, however all proposed road works are small-scale and localised, and no significant water quality effects are anticipated.

- A temporary access road for the facilitation of abnormal load deliveries will be required at Kennedy's Cross, located in the townland of Ballindown, Co. Offaly (junction of the N52 and the N62).
- Site Entrance 1 will serve as the entry point for turbine delivery into the Proposed Wind Farm (refer to Figure 4-36 for location). To facilitate turbine delivery, the existing construction access will be widened to the south and an extension of the existing underpass will be constructed.

Pathway: Extraction/excavation of peat and soil/subsoils (spoil).

Receptor: Peat and underlying subsoil.

Potential Pre-Mitigation Effect: Negative, slight, direct, likely, permanent effect on peat and subsoil.

Proposed Mitigation Measures:

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2.
- Mitigation measures in respect of proposed piling works are detailed at Section 8.5.2.7 where the residual effect of all piling works is also assessed.
- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

Residual Effect Assessment: Due to the minor nature of the works, combined with the implementation of the prescribed mitigation measures the residual effects of these works are considered - Negative, imperceptible, direct, likely, permanent effect on peat and subsoils.

Significance of Effects: Fo the reasons detailed above, along with the implementation of the prescribed mitigation measures, no significant effects on soils and subsoils will occur.

8.5.2.12 Potential Effects Associated with Biodiversity Management and Enhancement Plan

A Biodiversity Management and Enhancement Plan (BMEP, Appendix 6-5) has been prepared for the Proposed Project to offset the loss of habitats identified within the Proposed Project site and to further enhance the biodiversity of the site. The BMEP includes the provision of a 10ha flooded area and associated lakeshore. This will have a direct effect on the land environment at the site, with the replacement of cutover peat with this manmade lake habitat. It is proposed to control flooding such that water will be present during the winter months when whooper swan are present at the site.

Other measures included in the BMEP include replating of the immature woodland, enhancement and management for Marsh Fritillary, the planting of hedgerows and the enhancement of 10ha of grassland for lapwing.

Pathway: Biodiversity management land-take.

Receptor: Land and Land-use (*i.e.* the land upon which the biodiversity management will occur) and peat/subsoils.

Potential Pre-mitigation Effect: Positive, moderate, direct, likely, long-term effect on land and land-use at the Proposed Project site and a negative, slight, direct, likely, permanent effect on peat and subsoils due to disturbance and relocation within the site.

Proposed Mitigation Measures:

The BMEP will have a positive effect on the land environment and no specific mitigation measures are required. During the works the following mitigation measures will be implemented for the protection of the land, soils and geological environment:

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2;
- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

No additional specific mitigation measures are required.

Residual Effect Assessment: It is proposed to complete biodiversity management works at the site. The residual effect is considered to be a positive, moderate, direct, likely, long-term effect on land, peat and subsoils at the Proposed Project site.

Significance of Effects: For the reasons detailed above, along with the implementation of the prescribed mitigation measures, no significant effects will occur.

8.5.2.13 Potential Effects Associated with the Proposed Grid Connection

The Proposed Grid Connection includes the construction of steel masts and associated hardstand areas and crane pads both to the north of the proposed onsite 220kV substation and under the existing OHL. These works will require the excavation of peat and spoil, and the volumes are detailed in Table 8-10. These elements will be constructed using both founded and piled techniques.

Pathway: Extraction/excavation of peat and soil/subsoils (spoil).

Receptor: Peat and underlying subsoil.

Potential Pre-Mitigation Effect: Negative, slight, direct, likely, permanent effect on peat and subsoil.

Proposed Mitigation Measures:

- Mitigation measures in respect of peat and subsoil excavation are detailed in Section 8.5.2.2;
- Mitigation measures in respect of proposed piling works are detailed at Section 8.5.2.7 where the residual effect of all piling works is also assessed;
- Mitigation measures to prevent soil / subsoil contamination (leaks / spills) are dealt with in Section 8.5.2.3; and,
- Mitigation measures dealing with soil erosion are dealt with in Section 8.5.2.4.

No additional specific mitigation measures are required.

Residual Effect Assessment: Ground disturbance and peat and spoil relocation during these works will be minimal due to the relatively small footprint of the works areas. As such the residual effects of these works are considered - Negative, imperceptible, direct, high probability, permanent effect on peat and subsoils.

Significance of Effects: For the reasons detailed above, along with the implementation of the prescribed mitigation measures, no significant effects on soils and subsoils will occur.

8.5.3 Operational Phase - Likely Significant Effects and Mitigation Measures

Very few potential direct impacts are envisaged during the operational phase of the Proposed Project. These may include:

- Some construction vehicles or plant may be necessary for maintenance of turbines which could result in minor accidental leaks or spills of fuel/oil. Vehicles will also be present at the new proposed amenity carparks with approx. 20 amenity users expected per day;
- The transformer in the proposed onsite 220kV substation and transformers in each turbine are oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater; and,
- In relation to indirect impacts a small amount of granular material may be required to maintain access tracks during operation which will place intermittent minor demand on local quarries.

8.5.3.1 Potential Effects from Site Road Maintenance

In relation to indirect impacts a small amount of granular material will be required to maintain access tracks/site roads during operation which will place intermittent minor demand on local quarries. Please note the on-site borrow pits will have been reinstated with excavated peat and spoil following the construction stage and will not be available to source aggregate during the operational phase. Any maintenance works will be infrequent and temporary in nature.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, indirect, imperceptible, temporary (or sometimes brief), likely effect on peat, subsoil and bedrock.

Proposed Mitigation Measures:

- Use of aggregate from authorised quarries for use in road and hardstand maintenance.

Residual Effect Assessment: The use of aggregate for site road maintenance will be minor and infrequent, and all material will be imported to the Proposed Project from local authorised quarries. The residual effect is considered to be a negative, imperceptible, indirect, temporary (or sometimes brief), unlikely effect on peat, subsoil and bedrock.

Significance of Effects: For the reasons detailed above, no significant effects on land, soils or geology will occur.

8.5.3.2 Potential Effects from Site Vehicle/Plant Use

Plant and site vehicles used in site maintenance will be run on fuels and use hydraulic oils. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to land, soils and associated ecosystems. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, and is persistent in the environment.

Note that the risk posed by the amenity car parks is very limited due to small numbers of cars envisaged at any one time and the unlikely scenario of oil/fuel leaks from parked cars. Mitigation measures for hydrocarbon spills at amenity car parks are therefore not required.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, direct, slight, short term, unlikely effect on peat, subsoil and bedrock.

Proposed Mitigation Measures:

- Vehicles used during the operational phase will be refuelled off site before entering the Proposed Project site;
- No fuels will be stored on-site during the operational phase; and
- Spill kits will be available in all site vehicles to deal with an accidental spillage and breakdowns; and,
- An emergency plan for the operational phase to deal with accidental spillages and breakdowns will be contained in the finalised Construction and Environmental Management Plan (CEMP) (Appendix 4-4).

Residual Effect Assessment: The use of hydrocarbons in plant and vehicles is a standard risk associated with all operational wind farm sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect is considered to be - Negative, imperceptible, direct, short-term, unlikely effect on peat and subsoils and bedrock.

Significance of Effects: For the reasons detailed above, no likely significant effects on land, soils, subsoils or bedrock will occur.

8.5.3.3 Potential Effects from the Use of Oils in Proposed Onsite 220kV Substation and Turbine Transformers

The transformer in the proposed onsite 220kV substation and transformers in each turbine are oil cooled. There is potential for spills / leaks of oils from this equipment resulting in contamination of soils and groundwater. Hydrocarbon has a high toxicity to humans, and all flora and fauna, and is persistent in the environment.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, direct, slight, short term, unlikely effect on peat, subsoil and bedrock.

Proposed Mitigation Measures:

- The electrical control building (at the proposed onsite 220kV substation) will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- All transformer areas at the turbines will be bunded to 110% of the volume of oil used in each transformer;
- An emergency plan for the operational phase to deal with accidental spillages will be contained in the CEMP (Appendix 4-4).

Residual Effect Assessment: The use of hydrocarbons in transformers and substations is a common risk associated with operational wind farm sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and minimise potential effects on the local environment. The residual effect is considered to be - Negative, imperceptible, direct, short-term, unlikely effect on peat and subsoils and bedrock.

Significance of Effects: For the reasons detailed above, no likely significant effects on land, soils, subsoils or bedrock will occur.

8.5.4 Decommissioning Phase - Likely Significant Effects and Mitigation Measures

The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but of reduced magnitude.

During decommissioning, it may be possible to reverse or at least reduce some of the potential impacts caused during construction by rehabilitating construction areas such as turbine bases, hard standing areas. This will be done by covering the areas with peatland vegetation/scraw or poorly humified peat to encourage vegetation growth and reduce run-off and sedimentation. Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude. However, as noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore:

> *"best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".*

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.

Some of the impacts will be avoided by leaving elements of the Proposed Project in place where appropriate (e.g. turbine foundations). The proposed onsite 220kV substation will be retained by EirGrid. The turbine bases will be rehabilitated by covering with local topsoil/peat in order to regenerate vegetation which will reduce runoff and sedimentation effects. Internal roads will remain as amenity tracks which will be connected to the Offaly West Midlands Trails Network (OCC PL Ref: 25/60014). Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.

No significant effects on the soils and geology environment are envisaged during the decommissioning stage of the Proposed Project.

8.5.5 Risk of Major Accidents and Disasters

Due to the nature of the site, i.e. cutover raised bog, with residual peat deposits occurring in basins, and with relatively flat ground conditions, the risk of a landslide occurring at the site is low. To confirm this, a comprehensive Geotechnical and Peat Stability Risk Assessment has been undertaken for the proposed site (FTC, 2025) (Appendix 8-1), and it concludes that with the implementation of the proposed control (mitigation) measures outlined in Section 8.5.2.6 and in Appendix 8-1, the risk is determined to be negligible/none.

8.5.6 Assessment of Health Effects

Potential health effects arise mainly through the potential for soil and ground contamination. The Proposed Project is not a recognized source of pollution (e.g. it is not a waste management site or a chemical plant), and so the potential for effects during the operational phase are negligible. Hydrocarbons will be used onsite during construction however the volumes will be small in the context of the scale of the Proposed Project and will be handled and stored in accordance with best practice mitigation measures. The potential residual effects associated with soil or ground contamination and subsequent health effects are imperceptible.

8.5.7 Potential Cumulative Effects

Due to the localised nature of the proposed construction works which will be kept within the Proposed Project site, there is no potential for significant cumulative effects with other local developments on the land, soils and geology environment. There are some small areas of active turbary peat cutting within the site. These areas are very small in comparison to the scale of the site and the volumes of peat extracted are minor. There is no potential for significant cumulative effects on the land, soils and geological environment between the Proposed Project and the turbary activities.

The only pathway that the Proposed Project can have cumulative effects with other off-site projects or developments is via the drainage and surface water network. This hydrological pathway is assessed in Chapter 9: Water.

As part of the IPC licence rehabilitation requirements, BnM is required to produce cutaway bog decommissioning and rehabilitation plans, please see Appendix 2-4 to view the Draft Rehabilitation Plan for Lemanaghan Bog. These plans have considered the Proposed Project footprint and demonstrate that both peatland rehabilitation and renewable energy can coexist harmoniously onsite. Irrespective of any further development on the site, BnM's statutory duties to discharge the conditions of its IPC Licence will remain ongoing. Given the overlap of these proposals and the Proposed Project site, the Proposed Project has the potential to interact with the Draft Rehabilitation Plan; cumulative effects are assessed below.

The Peatland Climate Action Scheme (PCAS) which comprises enhanced peatland rehabilitation (above and beyond IPC licence requirements). This scheme is in addition to the IPC licence requirements and therefore does not form part of the Proposed Wind Farm application but has been cumulatively assessed.

8.5.7.1 Cumulative Effects with Substitute Consent and EPA Licensed Activities

As identified in Table 2-2 in Chapter 2: Background to the Proposed Project, an application for substitute consent was submitted to An Coimisiún Pleanála (Case Ref: SU19.323676) on 12th September 2025, for peat extraction and ancillary works from July 1988 to the present day that have been carried out within Lemanaghan Bog. A Remedial Natura Impact Statement (rNIS) and Remedial Environmental Impact Assessment Report (rEIAR) was submitted with this application. The rEIAR

undertaken for historical industrial peat extraction at Lemanaghan Bog concluded the following in relation to potential effects on peat and subsoils: '*The residual effect on peat following the implementation of the Draft Bord na Móna Cutaway Bog Decommissioning and Rehabilitation Plan that is currently proposed is a positive, direct, moderate, permanent effect on peat as it will be wetter and closer to its natural condition with increases in vegetation cover*'.

A negative, moderate, direct, likely, permanent effect on peat and spoil due to disturbance and relocation within the Proposed Project site (note that no peat/spoil will be stored or moved off-site) is concluded in this assessment for the Proposed Project given the implementation of appropriate mitigation measures, Section 8.5.2.2 above.

The objective of the Draft Rehabilitation Plan (Appendix 2-4) is to stabilise and rehabilitate the peat bog within the Proposed Project site. The Draft Rehabilitation Plan uses bespoke interventions designed to firstly stabilise the environment and secondly to rehabilitate the site as much as possible by placing the existing peatland environments on a path towards naturally functioning peatlands.

Much of the work associated with the decommissioning and rehabilitation will occur during the initial stages of the Draft Rehabilitation Plan. Once drain blocking and other measures have been implemented the operational activities will comprise non-intrusive ecological and hydrological monitoring and may also include minimal maintenance and repair works.

The implementation of the Draft Rehabilitation Plan in conjunction with the construction, operation and decommissioning of the Proposed Project as well as proposed, permitted and operational plans and projects listed in Chapter 2 of its EIAR is considered. The overall footprint of the Proposed Project will be ~3% of the total area of the site and therefore will not impact or change the overall goals and outcomes of the Draft Rehabilitation Plan. As such, it is the intention of the BnM to integrate the peatland remedial measures proposed as part of the substitute consent project with the Proposed Project. Overall, there are no significant negative cumulative effects when considering the future works associated with the Lemanaghan Bog (i.e., the Draft Rehabilitation Plan) and the Proposed Project.

The Draft Rehabilitation Plan will have a positive effect on land at the Proposed Project site as the degraded bog, which currently largely comprise of bare peat fields, will be replaced by an array of scrub, woodlands, wetland and peatland habitats.

Pathway: Excavation/hardstand construction and rewetting measures, natural colonisation and targeted revegetation.

Receptor: Soils/land

Potential Pre-mitigation Effect: Moderate, positive, direct, likely, long-term effect on land and soils/land.

Mitigation Measures/Impact Assessment:

The loss of peat bog land within the Proposed Project is minimal (~3% loss). On a wider scale, the Draft Rehabilitation Plan will be implemented across the entire Proposed Project site which has a total area of 1,258ha. If the Proposed Project were to proceed this land (34.3ha) will no longer be available for rehabilitation.

However, due to the small footprint of the Proposed Project, both in terms of the site and the wider area, the effects of actual peat bog land loss associated with the Proposed Project is negligible.

The Draft Rehabilitation Plan will be updated to incorporate the Proposed Project infrastructure. No additional mitigation measures are required.

Residual Cumulative Effect: The Proposed Project and the Draft Rehabilitation Plan have the potential to change landcover at the site. The Proposed Project will negatively affect soils/land whilst the Draft

Rehabilitation Plan will have a positive effect on soils/land. Given the small footprint of the Proposed Project, the residual cumulative effect is considered to be a positive, direct, moderate, likely, long-term effect on soils/land.

Significance of Effects: For the reasons detailed above (*i.e.* small development footprint), no significant effects on land or soils/land will occur.

8.5.7.2 Potential Cumulative Effects from PCAS

In 2023 the Peatland Climate Action Scheme (PCAS) selected Ballaghurt and Glebe Bogs located approximately 4.4km west of the Proposed Wind Farm at its closest point (i.e., T01), Clynan Bog located approximately 25.5km north of the Proposed Grid Connection, and Killeglan Bog located approximately 28.1km northwest of the Proposed Grid Connection for PCAS. In 2024, PCAS has selected Curraghalassa Bog and Derrynagun bog which are adjacent to the Proposed Project site. These two areas are on the southern side of the R436 road which connects Ferbane, Co. Offaly to Ballycumber, Co. Offaly. The two sections include an area of drained high bog, Curraghalassa Bog, located 65m south of the site and a larger section of cutaway bog, Derrynagun Bog, located 105m south of the site. No PCAS works are proposed within the Proposed Project site.

There is therefore no potential for cumulative effects to occur between the Proposed Project and PCAS works ongoing in nearby bogs during construction, operation or decommissioning. There will be no effects on the land, soils and geological environment outside of the Proposed Project site.

8.5.8 Post Construction Monitoring

None required.

8.6 EIA Classification Summary

Please see the below table for a summary of all identified impacts for the Proposed Project relating to land soils and geology.

Table 8-13: Assessment Classification Summary

Topic	Pre-Mitigation Effect	Mitigation Section Reference	Residual Effect	Significance
Construction Phase				
Land and Land-Use	Long-Term, Moderate, Negative	Section 8.5.2.1 – None Required	Long-Term, Moderate, Negative	Not Significant
Peat and Subsoil Excavation	Permanent, Slight/Moderate, Negative	Section 8.5.2.2	Permanent, Sight, Negative	Not Significant
Leakages and Spillages	Short-Term, Slight, Negative	Section 8.5.2.3	Short-Term, Imperceptible, Negative	Not Significant
Erosion of Exposed Subsoils and Peat	Short-Term, Slight, Negative	Section 8.5.2.4	Short-Term, Imperceptible, Negative	Not Significant

Excavation of Proposed Borrow Pits	Permanent, Moderate, Negative	Section 8.5.2.5	Permanent, Sight, Negative	Not Significant
Peat Instability and Failure	Permanent, Significant, Negative	Section 8.5.2.6	Permanent, Imperceptible, Negative	Not Significant
Piling Works	Permanent, Slight, Negative	Section 8.5.2.7 – None Required	Permanent, Slight, Negative	Not Significant
Geological Heritage Sites	N/A	N/A	N/A	N/A
Proposed Onsite 220kV Substation	Permanent, Moderate, Negative	Section 8.5.2.9	Permanent, Slight, Negative	Not Significant
Proposed Amenity Track	Permanent, Slight, Negative	Section 8.5.2.10	Permanent, Imperceptible, Negative	Not Significant
TDR Accommodation Areas	Permanent, Slight, Negative	Section 8.5.2.11	Permanent, Imperceptible, Negative	Not Significant
Biodiversity Management and Enhancement Plan	Long-Term, Moderate, Positive	Section 8.5.2.12	Long-Term, Moderate, Positive	Not Significant
Proposed Grid Connection	Permanent, Slight, Negative	Section 8.5.2.13	Permanent, Imperceptible, Negative	Not Significant
Operational Phase				
Site Road Maintenance	Temporary, Imperceptible, Negative	Section 8.5.3.1	Temporary, Imperceptible, Negative	Not Significant
Site Vehicle / Plant Use	Short-Term, Slight, Negative	Section 8.5.3.2	Short-Term, Imperceptible, Negative	Not Significant
Use of Oils in Proposed Onsite 220kV Substation and Turbine Transformers	Short-Term, Slight, Negative	Section 8.5.3.3	Short-Term, Imperceptible, Negative	Not Significant
Decommissioning Phase				

Land Soils and Geology	The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but of reduced magnitude.	N/A	N/A	Not Significant