APPENDIX 4-3

PEAT AND SPOIL MANAGEMENT PLAN

GDG
GAVIN & DOHERTY
GEOSOLUTIONS

Peat and Spoil Management Plan for Clonberne Wind Farm

Client	**MKO**
Document Ref.	20021-R-02-PSMP-04
Project Title	Clonberne Wind Farm
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03	09/04/2024	Update to Address final MKO comments	Chris Engleman	Stephen Curtis	John O'Donovan	John O'Donovan
04	14/06/2024	Update to revise Borrow Pit Spoil Management details.	Chris Engleman	Stephen Curtis	Stephen Curtis	Paul Quigley

DISCLAIMER

REVISION SUMMARY

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02	26/02/2024	All	Revision to address MKO comments
03	09/04/2024	All	Revision to address final MKO comments
04	14/06/2024	7, 8	Update to revise Borrow Pit Spoil Management details.

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EXECUTIVE SUMMARY

MKO commissioned Gavin and Doherty Geosolutions Limited (GDG) to undertake a Peat Management Plan (PSMP) for the proposed Clonberne Wind Farm. Following planning guidelines compiled by the Department of the Environment, Heritage and Local Government (DoEHLG), where peat is present on a proposed wind farm development, a peat management plan is required. The proposed Clonberne Wind Farm consists of 11 turbines, one 220kV substation and associated grid connection, two construction compounds, access tracks and associated additional infrastructure.

This report provides details on the approximate predicted volumes of peat to be excavated during construction, the characteristics and types of peat to be excavated, construction methodologies to reduce the volumes of peat to be excavated, and the guidelines for how and where this excavated peat will be placed, reused and managed. This peat management plan will be further developed and implemented after the Proposed Project receives consent. Further details and specific plans will be determined during the detailed design phase and once further confirmatory site investigations have been undertaken. These details will then be included in a detailed Peat and Spoil Management Plan as part of the detailed Construction Environment Management Plan (CEMP). The responsibility for implementing the PSMP will lie with the Principal Contractor. The peat thickness encountered by intrusive investigations across the site varies from negligible to a maximum of 6.65m, with an average of 1.68m recorded. Most of the site contains little to no peat, with T1-T4 and T9 located in areas of no peat and will be underlain by cohesive or granular glacial tills. Much of the remaining proposed infrastructure, including T5-T7, T10-T11, and the construction compounds, are located in areas of cut-over peat, where turbary peat harvesting has removed significant quantities of peat, reducing peat thicknesses. T08 is located in forestry, planted over peat of up to 2.16m thick. In total, 69.9% of recorded peat thicknesses were under 1m, and 85.6% were under 2m.

The existing access tracks will need to be upgraded, and new access roads will need to be constructed. The preliminary outline of road construction types, construction methodologies, and methods for constructing turbine bases, hardstandings, and other infrastructure foundations have been defined. Piled foundations will be used as an alternative to gravity base foundations where the ground conditions require it. Gravity foundations will be utilised at T1-T4 with precast piles the only alternative being considered at these locations. Of the proposed new access tracks, 7.6km are proposed to be of founded construction, while 2.4km is proposed for floated construction.

Preliminary volumes for the peat generated during construction are presented in this document, along with guidelines for handling and storing excavated peat and recommendations for good construction practices. It is calculated that the total peat excavation volume will be 49,370m^3, while the total spoil excavation volume will be 39,350m^3. It is assessed that the total capacity for placement and reinstatement of peat is 55,480m^3, and 42,400m^3 for spoil, leading to an overall balance of 6,110 m^3 of additional contingency capacity for peat, and 3,050 m^3 for spoil.

The peat management assessment findings indicate that all the peat material excavated can be placed safely on-site during construction.

1 INTRODUCTION

MKO requested Gavin and Doherty Geosolutions Ltd. (GDG) to prepare a Peat Management Plan (PSMP) on behalf of Clonberne Wind Farm Ltd. as part of an application for planning permission for the Proposed Clonbenre Wind Farm, Co. Galway, hereafter referred to as 'The Proposed Project Project'. The Proposed Project and peat depth plan are presented in Appendix A.

1.1 STATEMENT OF AUTHORITY

GDG is a specialist geotechnical and marine civil design consultancy that provides innovative engineering solutions to a broad infrastructure problem. Established in 2010, GDG has since grown to more than 180 people. We aim to deliver an innovative, cost-effective, and reliable service tailored to meet and exceed our clients' requirements. We strive to attain the highest possible standards and consistently seek to pioneer and develop new technologies and techniques while ensuring that all relevant design codes and practices are met.

GDG brings together state-of-the-art research and direct industry experience and offers a bespoke engineering service, delivering the most progressive, reliable, and efficient designs across various projects and technical areas, including forensic engineering and expert witness services to the Insurance and Legal sectors. Our clients include large civil engineering contractors, renewable energy developers, semi-state bodies, and engineering and environmental consulting firms.

GDG has been involved in many wind farm developments in both Ireland and the UK at various stages of development, i.e. preliminary feasibility, planning, peat stability assessment, design, and construction. The GDG team, made up of engineering geologists, geomorphologists, geotechnical engineers, and environmental scientists, has developed expertise in the design and construction of developments in peat areas.

The members of the GDG team involved in this assessment include:

- **Paul Quigley – Project Director**. Paul is a Chartered Engineer with over 26 years of experience in geotechnical engineering and a UK Registered Engineering (RoGEP) Advisor. He has worked on a wide variety of projects for employers, contractors and third parties, gaining a range of experience, including earthworks for major infrastructure schemes in Ireland and overseas, roads, tunnelling projects, flood protection schemes, retaining wall and basement projects, ground investigations and forensic reviews of failures. Paul is adept at designing creative solutions for complex problems and has published numerous peer-reviewed technical papers. He has also acted as an independent expert for several legal disputes centred on ground-related issues. He is a reviewer for the ICE Geotechnical Engineering Journal, a member of the Eurocode 7 review panel at NSAI and a former Chairman of the Geotechnical Society of Ireland.
- **John O'Donovan**. John leads the onshore renewable sector at GDG. He completed his PhD at Imperial College, investigating the use of DEM to model wave propagation techniques to measure small-strain soil stiffness. After completing the PhD, John spent 2.5 years working with BH's Ground Engineering Group. He has over ten years of experience in engineering and seven years in his current role. At GDG, John manages onshore wind farm projects and solar farm projects. John specialises in dealing with difficult ground conditions and providing robust designs for projects in peatland areas. John also works on the landfall and onshore aspects of offshore windfarms, including cable routing and onshore substation foundation design.

- **Stephen Curtis**. Stephen is a Senior Engineering Geologist on the onshore renewables team. He has over seven years of experience in both site investigation contracting and geotechnical consultancy environments. He is Chartered with the Institute of Geologists of Ireland (IGI) and the European Association of Geographers. Stephen has worked on multiple renewable energy projects, primarily solar and wind farm projects in Ireland and the UK, for over four years. He has been involved in the feasibility study, planning, design and construction stages of wind and solar farm developments, focusing on geotechnical risk management and mitigation for construction in upland peat areas and Irish glacial ground conditions.
- **Chris Engleman**. Chris is a Geologist with a Master's degree in Geological Sciences from the University of Leeds. He has four years of industry experience within the onshore renewables sector and the field of geological mapping with a particular focus on Quaternary geology, predominantly working on projects for peat stability and management, ground investigation, rock and soil logging, GIS mapping and geotechnical design. Chris has worked on several renewable energy projects, particularly wind and solar, for over two years. Chris supervised site investigation works at the Proposed Project in 2023.
- **Brian McCarthy**. Brian is a Civil Engineer within the infrastructure team in GDG with two years of post-graduate experience. Brian holds a Master's degree in Civil, Structural and Environmental Engineering from University College Cork and is a member of the Institution of Engineers of Ireland. Brian has worked on various renewable energy and infrastructural projects in Ireland and the UK and has carried out peat probing on several projects throughout Ireland. Brian lead peat probing site investigation works at the Proposed Project in 2023.
- **Efstathia Chioti**. Efstathia is a Geotechnical Engineer within the structures team in GDG with 2 years of industry experience. Since joining GDG, Efstathia has completed geotechnical design work on various projects, including retaining wall design, shallow foundation design and earthworks, and ground movement assessment in Ireland and the UK. She has strong technical skills within geotechnical design. Efstathia lead peat probing site investigation works at the Proposed Project in 2023.
- **Daniel Murphy.** Daniel is a Graduate Engineer working in both the GDG Infrastructure team and the Structures team. He has a Masters' degree in Civil Structural and Environmental Engineering from University College Cork and has been working with GDG since graduating in 2022. Daniel has worked on a variety of Temporary Works and Permanent Works design projects in Ireland and the UK. Daniel has carried out site inspections, visual assessments of slopes, peat probing and water sampling on a number of projects throughout Ireland. Daniel carried out peat probing at the Proposed Project in 2023.

1.2 GUIDANCE DOCUMENTS

This PSMP has been prepared with consideration of industry best practices relating to wind farm construction and peatlands. This best practices include:

- Wind Energy Development Guidelines. Department of Housing, Planning and Local Government (2006);
- Draft Revised Wind Energy Development Guidelines. Department of Housing, Planning and Local Government (2019);

- Good practice during wind farm construction. A joint publication by Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland (2015);
- Scottish Government, Guidance on Developments on Peatland – Site Surveys (2017);
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste, Scottish Renewables and SEPA (2012); and
- Floating Roads on Peat, Scottish Natural Heritage (2011).

Many of the publications listed above have been developed by the Scottish Regulators and are considered best practice in Ireland and are therefore appropriate for reference within this PSMP.

This PSMP and compliance with it shall not relieve the developer of its obligations to undertake detailed ground investigations or geotechnical design before construction or any obligations relating to other aspects of the environment.

1.3 PROPOSED PROJECT

The Proposed Project is located approximately 14km northeast of Tuam and approximately 6.5km southeast of Dunmore in Co. Galway. The approximate location of the centre of the site is X554464, Y756549 in Irish Transverse Mercator (ITM). The proposed site covers approximately 353 hectares (Appendix A, Figure A-1-1).

The Proposed Project Description is detailed in Chapter 4 of the Environmental Impact Assessment Report (EIAR), which includes the works subject to a proposed planning application for An Bord Pleanála about the Proposed Wind Farm Site.

The Proposed Wind Farm Site will comprise the elements listed below:

1. 11 No. wind turbines and associated hardstand areas;
    a. Tip Height of 180m
    b. Rotor Diameter of 162m
    c. Hub Height of 99m
2. A 35 year operational life from the date of full commissioning of the wind farm and subsequent decommissioning;
3. Upgrade of existing tracks/ roads and provision of new site access roads, junctions, and hardstand areas;
4. All works associated with the provision of a new permanent site entrance off the R328 Regional Road in the townland of Killavoher;
5. 2 no. Temporary construction compounds;
6. 1 no. Borrow pit;
7. Peat, Spoil and Overburden Management Areas;
8. 1 no. permanent 220kV electrical substation which will be constructed in the townland of Cloonarkan. The proposed electrical substation consists of a two-storey control building with welfare facilities, all associated electrical plant and equipment, battery storage system, security fencing, all associated underground cabling, wastewater holding tank and all ancillary works and equipment;
9. Underground electrical (33kV) and communications cabling from the proposed wind turbines to the proposed 220kV substation;

10. All works associated with the connection of the Proposed Project to the national electricity grid, via the provision of the underground electrical cabling (220kV) to the existing 220kV overhead line in the townland of Laughil;
11. The provision of 2 no. new interface towers replacing two existing angle masts to facilitate the connection to the existing overhead line;
12. Provision of 1 no. joint bays, communication chambers and earth sheath links along the underground electrical cabling route;
13. Reinstatement of the road or track surface above the proposed cabling trench along existing roads and tracks;
14. Junction Accommodation works to facilitate turbine delivery;
15. Site Drainage;
16. 1 no. Peatland Enhancement Area
17. Tree Felling;
18. Operational stage site signage; and
19. All associated site development works and apparatus

The Proposed Project has been designed with an operational life of 35 years, at the end of which it can be decommissioned. The Applicant is therefore seeking a ten-year permission and a 35-year operational life from the Proposed Project's commissioning date. Please refer to Chapter 4 of the EIAR for a detailed description of the development.

This report examines the conditions at the Proposed Project Site, located within the EIAR Site Boundary as defined in Chapter 1 of the EIAR, and does not analyse the transport delivery route. The transport delivery route has not been included in this report as no peat stability risk is expected along the route. Works on the transport delivery route are not expected to be carried out in peat material and will not require excavating or placing significant amounts of material. The '*Proposed Project Project'* or '*Site'* in this report refers to the core of the Proposed Project and grid connection route as defined in Chapter 4 of the EIAR.

1.4 SCOPE OF REPORT

This report contains the following:

- A summary of proposed construction activities on-site;
- A review of peat conditions on-site;
- Road construction types;
    - Methodologies for the construction of each type of access road and road construction details;
- Methodologies for the excavation of turbine bases, hardstands, substation and compounds,
- Summary of the area proposed for peatland enhancement,
- Summary of the on-site borrow pit location and typical detail drawings;
- Peat and spoil excavation and reinstatement volumes,
- Summary of peat and spoil repository areas and typical detail drawings;
- Guidelines for handling and storing excavated peat and spoil, and
- Recommendations for good construction practice.

1.5 Summary of Construction Activities

For the construction phase, the activities that are considered likely to generate peat are as follows:

1. The construction of new excavated roads. We note that floating road construction does not require peat excavation.
2. The upgrade and widening of existing founded access roads.
3. Excavations for cable trenches beneath new roads.
4. Excavations for turbine bases, hardstands, construction compounds and substation.

1.6 General Principles of Peat and Spoil Management

The general purpose of the PSMP is to outline the methodologies of peat excavation and reinstatement, outline the safety steps required for the safe placement and management of peat material, and minimise disruption to the peatland environment. The methods outlined in the report aim to:

- Reduce the exposure of bare or excavated peat material,
- Reduce the potential for release of sediment into watercourses or groundwater,
- Ensure that the Proposed Project does not adversely impact the landscape and environment,
- Ensure good site management practices are followed throughout the Proposed Project's construction, operation, and decommissioning phases.

Consideration needs to be given to the risks created by peat excavation, placement, and reinstatement, both temporary and permanent. These risks will be managed and mitigated through the methodologies outlined in this Peat and Spoil Management Plan document and the associated Peat Stability Risk Assessment Report (PSRA, EIAR Technical Appendix 8-1).

Placement or any reinstatement of excavated peat material will be carried out in a fashion which ties in with the existing natural topography and facilitates the reduction of the visual impact on the structures of the Proposed Project. This can be done by landscaping the placed peat with shallow slopes, promoting natural vegetation growth, and allowing for controlled drainage from all structures.

All reinstatement works will be carried out considering potential peat instability, having completed a diligent design and considering the findings of the associated Peat Stability Risk Assessment Report (GDG 20021-R-01-PSRA-01). Works will be carried out under the supervision of an appropriately experienced geotechnical engineer and the Project Ecologist.

2 PEAT CONDITIONS AND STABILITY

2.1 SITE CONDITIONS

An assessment of the ground conditions encountered during the ground investigations and reviewing the available existing mapping suggests that the Proposed Project site consists of a generally flat topography, with occasional ridges of glacial material (Drumlins) separating large, flat-lying raised peat bogs, which have been subject to heavy turbary peat harvesting. This activity has led to large expanses of flat-lying, cut-over shallow peat, where much of the planned infrastructure is located. According to the available GSI mapping (Figure 2-1) and GDG's site observations, Turbines T1-T4 and T9 are located on glacial material, while T5-T7, T10 and T11 are located in areas of open, cut-over raised bog. T8 is located on cut-over peat, which has been planted for forestry.

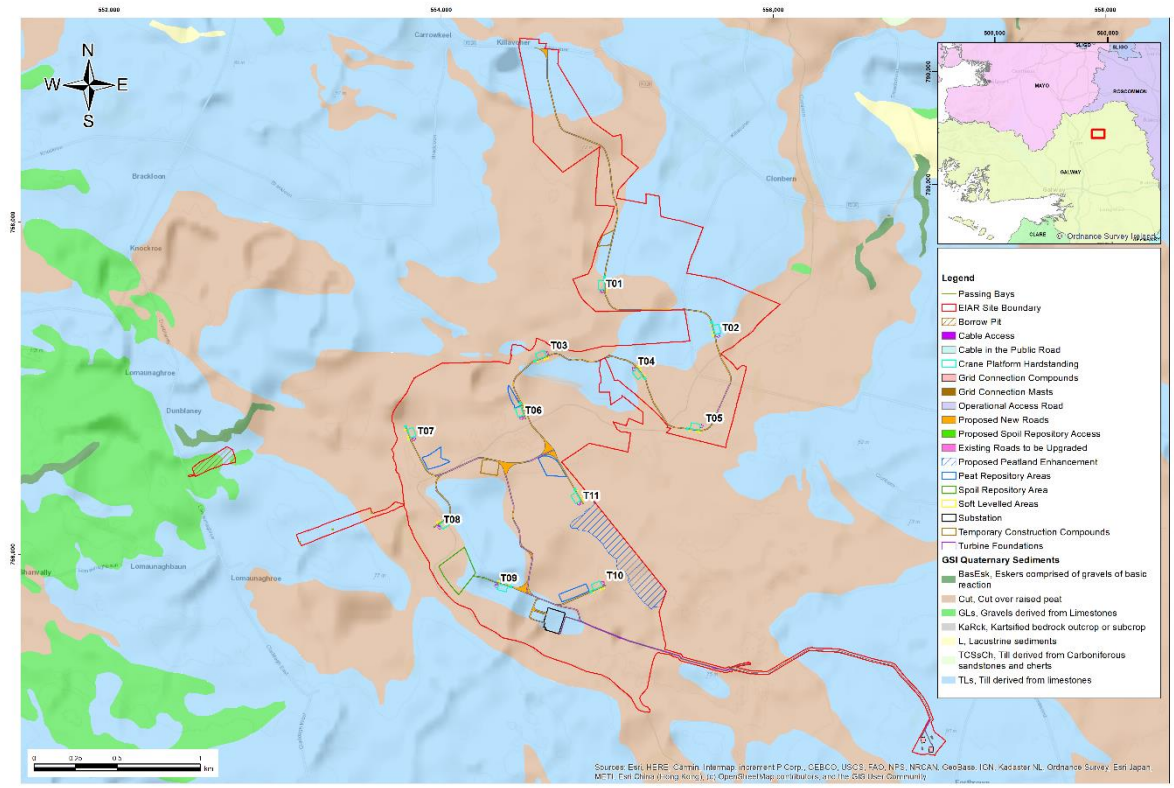


Figure 2-1: GSI Quaternary Sediments map, showing areas of cut-over peat and glacial till dominating the area.

2.2 PEAT CLASSIFICATION

The Scottish Government provides guidance as to the definition of peat in their Peat Survey Guidance document:

"*the Joint Nature Conservation Committee (JNCC) Report 445, Towards an Assessment of the State of UK Peatlands, definitions are used:*

- *Peaty (or organo-mineral) soil: a soil with a surface organic layer less than 0.5m deep;*
- *Peat: a soil with a surface organic layer greater than 0.5m deep which has an organic matter content of more than 60%;*

- *Deep peat: a peat soil with a surface organic layer greater than 1.0m deep*."

For this report, peat is considered with respect to the two principal types:

- Acrotelm: This upper layer comprises of poorly decomposed plant material and living vegetation. It is relatively dry with some tensile strength, providing limited structural properties. For peat classification in this report, the Acrotelm layer will be considered to be inclusive of 'peaty soil'.
- Catotelm: This lower layer is formed by highly decomposed humified peat decaying at a rate of several orders of magnitude slower than the acrotelm. As this catotelm layer grows, the slow peat formation represents an important sink for atmospheric CO^2. The amorphous structural of this layer is particularly vulnerable to excavation and disturbance as it tends to disintegrate completely on excavation. For the classification of peat in this report, the Catotelm layer will be considered to include 'peat' and 'deep peat' soils.

It is noted that data obtained through peat probing cannot be utilised in classifying the peat material, given that peat probing does not fully distinguish between the different types of peat material and between peat and other soft ground. It is considered that the sampling records from the intrusive investigation provide the most accurate representation of peat depths across the site. The trial pitting carried out in February 2020 allows peat conditions to be described in a small number of locations (Section 2.4). However, the peat probing data generally compares well with the other intrusive data, so all data types, peat probe, trial pit and hand shear vane locations, have been used in the peat thickness assessment.

The interpolated peat thickness plan for the Proposed Project is shown in Figure 2-2 and is shown in greater detail in Appendix A.1 Figure A-1 2 to Figure A-1-4.

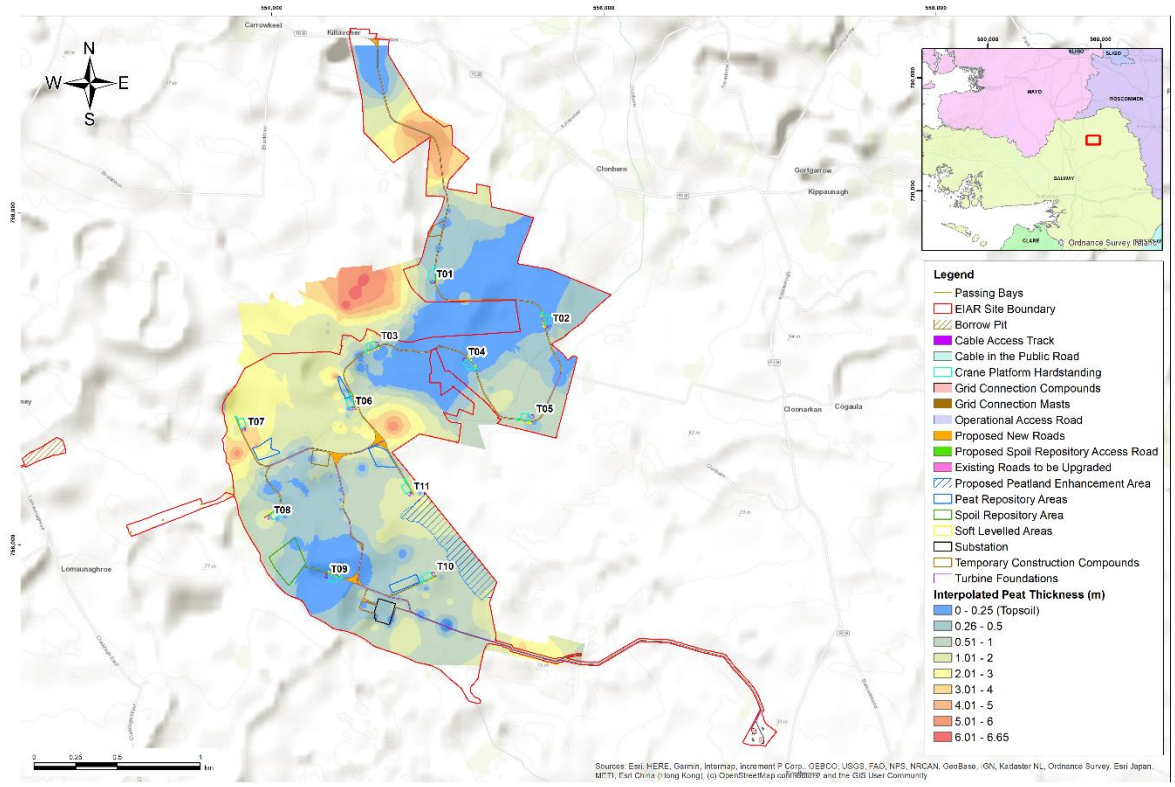


Figure 2-2: Interpolated peat depth plan of the main site area

2.3 GROUND INVESTIGATION AND ENCOUNTERED PEAT THICKNESS

GDG conducted a site reconnaissance as part of the assessment, comprising four walk-over inspections (February 2020, March 2020, May 2023, and September 2023) to record geomorphological features concerning the Proposed Project, peat depths, and peat strength. An indication of the site conditions (harvested peat, peat bogs, wetlands, and forestry) with flat topography is shown in Figure 2-3 and Figure 2-4. Access was limited to some areas, in particular, the area proposed for peatland enhancement in between T10 and T11, limiting the number of peat probes taken in this area.

Figure 2-3: Harvested peat close to T11.

Figure 2-4: Peat cuts 100m east of T10.

Seven ground investigations (GI) were carried out on the site:

1) MKO (May 2019): 21 peat probes
2) GDG (February 2020): 47 peat probes and 7 hand shear vanes.
3) GDG (February 2020): 15 trial pits.
4) GDG (March 2020): 47 peat probes.
5) MKO (May-June 2021): 5 open-hole well boreholes.
6) GDG (May 2023): 40 peat probes and 3 shear vanes.
7) GDG (September 2023): 39 peat probes and 4 shear vanes.

In summary, intrusive ground investigations were carried out at 229 locations. The findings of these GIs are summarised in the GDG Peat stability Risk Assessment (PSRA) report, Ref.:20021-PRSA-001-01 (EIAR Technical Appendix 8-1). The GI locations considered the following criteria:

- Spatial distribution of the proposed infrastructure;
- Distance between probe points to avoid interpolation of peat depths across large distances;
- Changes in slope angle, as peat depths are likely to be shallower on steeper slopes;
- Changes in vegetation, which can reflect changes in peat condition;
- Changes in hydrological conditions; and
- Changes in land use.

No evidence of any significant previous landslides was identified during the walkovers. Some possible instability indicators were identified in the southeast of the area proposed for peatland enhancement, which are described in more detail in the PSRA (EIAR Technical Appendix 8-1).

A raster map was created in GIS software presenting the interpolated peat depth across a site from the peat probe points using the Inverse Distance Weighted (IDW) method. This interpolated raster of peat depth is shown in Figure A-1 2 to Figure A-1-4 in Appendix A. The trial pit logs can be seen in Appendix A.4.

2.4 Ground Investigation Summary and Peat Conditions

The ground investigations indicate that the ground conditions at the site comprise predominantly areas of cut-over raised peat of up to 6.65m in depth, with patches of glacial till in the north, centre, and south of the site. Trial pit locations (Appendix A.4) suggest that the peat is typically underlain by granular or cohesive glacial material, with trial pits encountering stiff gravelly clays, gravelly sands, and sandy gravels beneath the peat or beneath topsoil in several locations.

Petersen Drilling Services Ltd. additionally carried out five open-hole boreholes for the purpose of the hydrological assessment (Chapter 9 of the EIAR). These boreholes encountered a similar mix of cohesive and granular glacial tills, and all encountered bedrock between 6m bgl and 16m bgl.

The peat thickness encountered by intrusive investigations across the site varies from 0m to a maximum of 6.65m, with an average of 1.68m recorded. Most of the site contains little to no peat, with T1-T4 and T9 being located in areas of no peat, underlain by cohesive or granular glacial tills. Much of the remaining proposed infrastructure, including T5-T7, T10-T11, and the construction compounds, are located in areas of cut-over peat, where turbary peat harvesting has removed

significant quantities of peat, reducing peat thicknesses. T08 is located in forestry, planted over peat of up to 2.16m thick.

The frequency of different peat thicknesses is shown in Figure 2-5. In total, 69.9% of recorded peat thicknesses were under 1m, and 85.6% were under 2m. Peat probe locations specifically targeted areas of identified peat; therefore, the density of probes in areas of peat thicknesses greater than 0.5 is higher than in areas of peat thicknesses less than 0.5m.

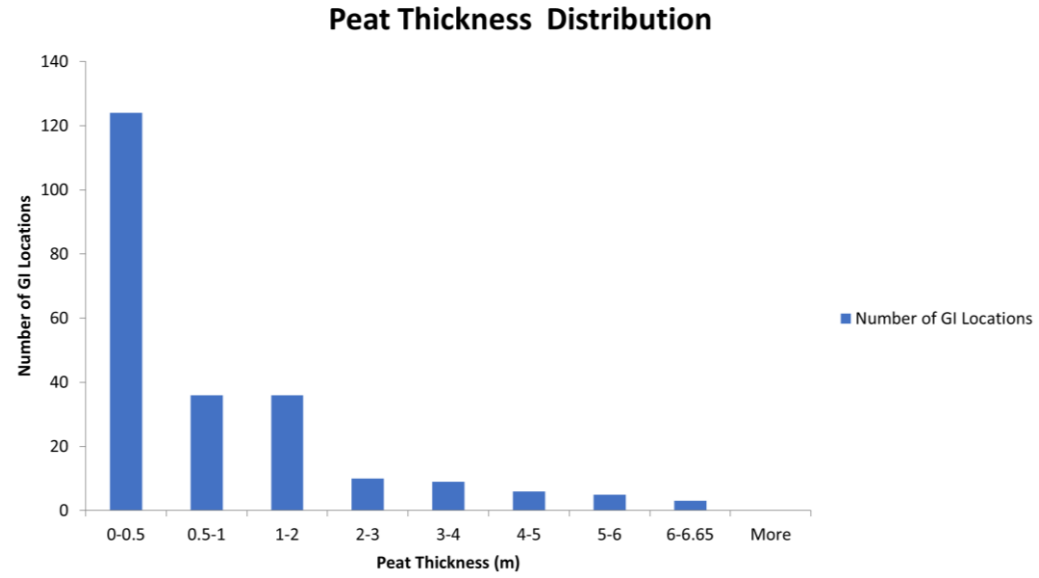


Figure 2-5: Histogram of peat thickness results across the site.

Laterally, extensive regions of >2m in depth were encountered in high-rise bog settings, particularly to the east of T07, south of T11, northeast of T10, west of T6, and between T01 and T3. These areas of deep peat are restricted to discrete raised bogs, which all major infrastructure postioning has avoided. The depths encountered are considered moderate to deep in places, with probes identifying peat thicknesses of up to 6.65m.

The walkover indicated that the peat was being cut in several areas and had drained significantly, with the observed peat classified as the catotelm. The surface condition of the peat is varied, with some areas having bare peat at the surface where cutting is active, as shown in Figure 2-3 and Figure 2-4, and some areas of un-cut peat capped by heather, with visible acrotelm. A large variation in the level of decomposition and humification was observed throughout the peat body. However, this generally appeared to increase with depth. Most of the peat material identified at the site during the trial pitting (Appendix A.4) is logged as fibrous and pseudo-fibrous, indicating that it is largely acrotelmic and will be suitable for landscaping and reinstatement adjacent to proposed infrastructure locations. Trial pits were not carried out in areas of >2m peat thickness, so there are likely to be areas of catotelmic peat which have not been logged. Hand shear vanes were carried out in 14 locations across the site, with results ranging from 18 to 70kPa.

2.4.1 Classification of Non-Peat Spoil

As noted in Section 2.4, subsoils across the site typically consist of granular or cohesive glacial material, with trial pits encountering stiff gravelly clays, gravelly sands, and sandy gravels. The stiff gravelly clays are interpreted as cohesive glacial tills, and the sands and gravels are interpreted as granular glacial tills or glaciofluvial deposits. A small percentage of the cohesive glacial till may be used to construct safety berms across the site. However, it is not considered that this material will

be suitable for use as engineering fill material, and so it will be considered as spoil. Some of the granular glacial till/glaciofluvial material may be suitable for reuse, pending further ground investigation and classification lab testing. The estimated volume of spoil material generated by construction at the Proposed Project is outlined in Section 8.

2.5 PEAT STABILITY RISK ASSESSMENT

A Peat Stability Risk Assessment has been undertaken for the site (EIAR Technical Appendix 8-1). Without the Proposed Project on-site, i.e. no additional loading on the peat slopes, the site is considered to be stable. Modelling has shown localised zones within the EIAR Site Boundary that become less stable with a 10kPa surcharge, akin to a 1m peat thickness on top of existing ground.

Areas of restricted stockpiling and construction have been identified as part of the PSRA (EIAR Technical Appendix 8-1) and are presented in Figure A-2-1 to Figure A-2-3 in Appendix A.2.

The restriction areas consist of:

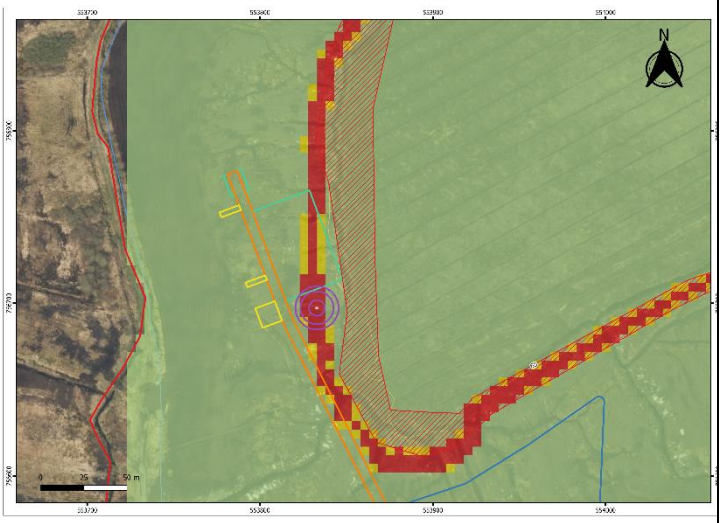
- Safety buffer areas – areas which **will be restricted for construction.** No development or construction activities will be carried out in these areas, including plant movements, peat or overburden excavation or reinstatement or placement of peat or any overburden materials.
- Peat stockpile restriction areas are **not restricted for construction but shall not be used for stockpiling of peat/side casting or overburden materials**. The Proposed Project footprint may occur within these areas, but peat placement and reinstatement are not permitted within these buffers. Any material excavated from within the peat restriction areas must be removed immediately and safely reinstated with a designated area elsewhere.

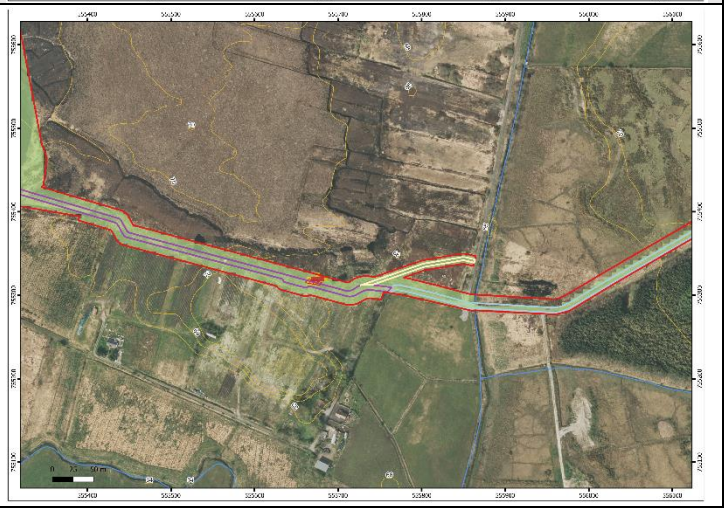
As outlined in the PSRA (EIAR Technical Appendix 8-1), the development of the safety buffer areas is a semi-automated approach which combines the developed polygon areas of the Scottish Executive (2017) factor of safety (FoS) results, areas of risk identified during the site walkovers and potential risk areas identified from the examination of peat depths and site topography. Safety Buffer Areas are outlined in Appendix A.2. Areas included in the safety buffer areas include an area of thick, raised peat to the east of T7.

Peat stockpile restriction areas are locations where the Proposed Project site layout encounters an area where a stability risk has been encountered with the addition of a 1m surcharge only and is otherwise considered stable in its natural state. The risk at these locations can be examined by looking at the geometry of the local slope and the proposed construction methodology, and the hazards will be mitigated with restricted peat and spoil placement and limiting plant operations within the area.

The stockpile restriction areas are outlined in Appendix A.2 Figure A-2-1 to Figure A-2-3, and some of the locations where key infrastructure encounter safety buffer zones are outlined in Table 2-1.

Table 2-1: Safety buffer zones at key locations.

Risk and mitigation	Undrained surcharged FoS analysis
The area at the hardstand and foundation for T7 suggests a FoS of <1 with the application of a 10kPa surcharge. Based on site observations and a study of aerial imagery, it is determined that this region of calculated low FoS is caused by locally deep peat and a steep slope at an existing peat cut face. A study of temporal aerial imagery (PSRA, EIAR Technical Appendix 8-1) indicates that the peat cut face has migrated east due to continued cutting activities since the capturing of both the topo data and the deepest peat probes at this location. This would indicate that the locally steep slope and deep peat have also migrated eastwards. Due to this information, the safety buffer zone in this location has been manually shifted to the east to follow the newly interpreted edge of the peat mass. It is, therefore, interpreted that the low FoS is not representative of current on-site conditions and does not represent a true hazard at this location. It is also noted that this turbine foundation is proposed to be piled, which will further limit any possible risk stability at this location. Further mitigation measures at the existing peat cutting include the stabilising of the cutting with excavated material and reinstatement to a natural gradient. Ensuring adequate Drainage and avoidance of drying out the peat, will also improve stability at this location.	

Risk and mitigation	Undrained surcharged FoS analysis
A small section of road interacts with an area of FoS <1.3 in the undrained scenario with 10kPa surcharge. This calculated low factor of safety is assessed to arise from locally deep peat and high slope angles at relict existing peat banks. It is determined that these do not present a global risk of peat failure, but that the ground must be levelled and stabilised locally prior to construction.	
A small area identified has a FoS <1. in the undrained scenario with a 10kPa surcharge interacts with a small section of the cable route. This low factor of safety is assessed to arise from locally deep peat and high slope angles calculated at relict existing peat banks. It is determined that these do not present a global landslide risk. The ground must be levelled and stabilised locally before construction, and peat will not be placed adjacent to the road in this area.	

3 HANDLING AND PLACING EXCAVATED PEAT AND SPOIL

Inappropriate placement of excavated peat and overburden and uncontrolled loading of peat material are considered among the main causes of peat instability and landslide event triggers during the wind farm construction process. The management and control of these activities is key to de-risking peat stability at the windfarm site.

The following outlines guidelines for the careful handling and placement of peat at the Proposed Project site:

1. Care shall be taken during peat excavation to ensure it is segregated from other soil types. Therefore, particular care will be taken to review recorded peat depths.
2. Peat shall be separated and placed by type, namely the acrotelmic and catotelmic layers.
    - Acrotelm (interpreted as the upper 0.5m of peat) is generally required for landscaping and shall be stripped and temporarily placed for reuse as required. Acrotelm stripping shall be undertaken before the main excavations.
    - Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage the growth of plants and vegetation.
    - All catotelm peat (peat below about 0.5m depth) shall be transported immediately on excavation to the designated peat repository areas,
    - The careful handling and segregation of peat types will help to optimise the reuse of peat, aiding in the retention of structure and integrity of the excavated peat material.
3. Peat and spoil shall be separated and stored separately in designated peat and spoil repository areas. It is not proposed to place peat in the borrow pit.
4. Depending on what vegetation is found on site, more fibrous material may be placed at steeper angles. Unconsolidated peat, generally comprising of catotelmic material, is often not suitable for general dressing, and any unconsolidated peat excavated must only be used for reinstatement where such reuse poses no risk of polluting water courses and evidence can be provided that the required water table at the chosen location can be maintained. However, from a review of the ground investigation logs, which identify predominantly fibrous and pseudo-fibrous material, it is considered that the material excavated will be generally suitable to facilitate:
    - Placement in designated Peat Repository Areas
    - Placement in restricted thicknesses on track shoulders and around infrastructure locations where topography permits.
5. Construction sequence planning shall minimise the time that peat is placed before reuse; however, some temporary peat placement will be required for spoil management and separation of spoil horizons before it can be placed in its reinstatement location. The principles on which the temporary placement of excavated peat will be based upon the general and particular placement and handling methodologies set out within this section. Temporary placement will be safe as it protects the structure and integrity of the excavated peat subject to prevailing local conditions. Temporary placement of peat must not be carried out in:
    - any area outlined as a peat stockpile restriction or safety buffer area in Section 2.5.
    - Areas possessing a slope angle of greater than 5°,

- Areas within 50m of a watercourse.

6. Reinstatement of peat and peat turves will be completed during the Construction Phase at the earliest practicable opportunity to avoid prolonged placement.
7. Any temporary placement locations will be in suitably wet conditions or be irrigated to prevent the peat from desiccating and precautions will be taken to ensure that turves are not allowed to dry out before reinstatement. The condition of turves will be monitored throughout the duration of placement. Irrigation of peat turves will be agreed in advance with the Ecological Clerk of Works (ECoW). Should wetting of turves be required to prevent desiccation, mitigation will be adopted to prevent run-off or discharge to any adjacent watercourses.
8. Sequencing of construction activities will be timed to allow peat placement in at least one peat repository area during all phases of construction. It may be necessary to utilise existing roads before the upgrade to allow the placement of peat in the initial phases of construction.
9. Plant movements and haul distances related to earthworks activity and peat excavation will be kept to a minimum.
10. Peat and spoil repositories cannot substantially erode or become dry.
11. Any material stockpiles or repository locations will be located at least 50m away from watercourses, including site ditches/sheughs, to reduce the potential for sediment to be transferred into the wider hydrological system.
12. Where possible, excavation will be timed to avoid very wet weather, periods of extreme rainfall and/or extended periods of prolonged rainfall.
13. Peat and spoil repository locations have been selected to limit re-handling as far as reasonably possible.
14. Excavated peat will be placed as close as possible to the immediate area of excavation.
15. The Contractor will consult the ECoW to agree on locations for material stockpiles and to avoid potential impacts on sensitive ecological receptors.
16. The Contractor will consult the site Geotechnical Engineer and review and take into account the PSRA (EIAR Technical Appendix 8-1) to avoid the risk of peat instability in peat excavations, peat stockpiling and all material stockpiling in areas underlain by peat.
17. Runoff from repositories shall be directed through the site drainage system, including silt fences, settlement ponds and other drainage measures as appropriate. These details will be outlined in the Contractor's Construction and Environmental Management Plan.

The following particular recommendations/best practice guidelines for the placement of peat and spoil with respect to specific aspects of the Proposed Project site will be considered and taken into account during construction.

3.1 ACCESS ROADS, HARDSTANDS AND OTHER INFRASTRUCTURE:

1. Controlled quantities of peat and spoil shall be side-cast adjacent to access roads and other infrastructure only where it can be placed in a stable formation, i.e. where the topography and ground conditions allow.
2. Side cast peat material shall consist of the acrotelm (upper layer) only and be landscaped and shaped to aid in reinstating the construction into the surrounding environment.

3. Cohesive spoil may be used to construct safety berms alongside access roads to heights of no greater than 1m and slopes not exceeding 1(V):2(H), unless a site-specific assessment during detailed design indicates a greater height and angle is safe.
4. Peat shall only be cast to safe heights and slope angles, considering the topography and the ground conditions. This height shall be no more than 1m, and the slopes shall be not greater than 1 (V): 3 or 4 (H) unless a site-specific assessment during detailed design indicates a greater height and angle is safe.
5. The effect of drainage or water runoff shall be considered when placing peat or spoil adjacent to access roads. Peat and spoil material shall not interfere with drainage, risk blocking of drainage systems or runoff into drainage systems.

3.2 PEAT REPOSITORY AREAS:

1. Peat repository areas have been identified at locations where the topography (slope angle <5°), peat depth, resulting stability assessment (FoS of >1.3 for 1m peat surcharge) and other environmental constraints (including 50m buffer from all watercourses) have allowed. These areas are designated for the permanent placement of up to 1m of peat material.
2. A cell berm will be constructed similarly to the peat repository area detail outlined in Appendix B. This cell berm will help to prevent the flow of saturated peat material. The stone berm will be constructed with a sufficiently coarse granular material or rock to enable the drainage of the placed peat material and prevent any instabilities within the repository area.
3. The stone cell berm will require a geotextile separator. The stone cell berm will be constructed using low-ground pressure machinery working from bog mats where necessary. The founding stratum for each stone buttress will be inspected and approved by a competent geotechnical engineer.
4. The height of the cell berm constructed will be greater than the height of the placed peat & spoil to prevent any surface peat runoff. Berms up to 1.25m in height will be required, subject to detailed design.
5. The cell berm is subject to the detail designer's specification; however, some peat excavation or installation of a shear key may be required to prevent global instabilities within the stored material. The shear key will comprise an excavation below the existing ground level beneath the cell berm to provide resistance against lateral forces.
6. Where possible, the placed peat and spoil surface will be shaped to allow efficient runoff of surface water from the peat and spoil repository areas.
7. Silting ponds will be required at the repository area's lower side/outfall location.
8. Intermediate berms or buttresses of spoil material may be installed within the peat repository area to aid in the placement and stability of the peat material. These berms will be shaped to align with the contours of the repository area.
9. The Contractor shall make every reasonable effort to promote growth in the peat repository areas following the placement of peat and completion of construction stage activities. Upper acrotelm layers shall be placed on the surface the right way up to promote vegetation growth. This growth will aid in stabilising the placed peat material and help in preventing it from becoming saturated following heavy periods of rain.

3.3 SPOIL REPOSITORY AREAS:

1. Cohesive glacial tills considered unsuitable for reuse in the Proposed Project will require placement in a separate spoil repository area.
2. The spoil repository area has been identified in a location where the topography (slope angle <5°), peat depth, resulting stability assessment (Factor of Safety of >1.3 for 1m peat surcharge) and other environmental constraints (including 50m buffer from all watercourses) have allowed. This area is designated for permanently placing up to 1m of non-peat spoil material.
3. Side slopes of placed spoil material are to be no greater than 1(V):2(H).
4. Where possible, the surface of the placed spoil will be shaped to allow efficient surface water runoff from the peat placement areas.
5. Silting ponds may be required at the repository area's lower side/outfall location.
6. Intermediate berms or buttresses of granular material may be installed within the spoil repository area to aid in the placement and stability of the spoil material. These berms will be shaped to align with the contours of the repository area.

The Contractor shall make every reasonable effort to promote growth in the spoil repository areas following the placement of spoil and completion of construction stage activities.

4 ROAD CONSTRUCTION TYPES

Existing roads will need to be upgraded and new access roads will need to be constructed at the proposed Clonberne Wind Farm. The following factors are considered in the preliminary proposals for road construction types:

- Constructability;
- Serviceability requirements for construction and wind turbine delivery and maintenance vehicles;
- Peat depth;
- Horizontal longitudinal and cross-fall gradient of the roads;
- Minimisation of excavation arisings; and
- The requirement to minimise disruption to peat hydrology.

The above key principles are used to determine the road type and will be finalised with regard to the prevailing ground conditions encountered during the confirmatory site investigation stages.

Floating roads minimise the impact on the peat, particularly peat hydrology. As there is no excavation required, no peat arisings are generated. However, a founded-type access road is more suitable if the underlying peat has an insufficient bearing capacity or is due to topographic restrictions or stability concerns.

The preliminary road construction details proposed for the development are summarised below in Table 4-1. The details of the road construction types are included in Appendix C. The distribution of propsed road construction types are show in in Figure A-3-1 to Figure A-3- 3 in Appendix A.

Table 4-1: Road construction types

Construction method	Appendix B Detail reference	Construction type
Construction of new roads	A	Founded
	B	Floating
Upgrade of existing access roads	C	Founded
	D	Floated

The design criteria for the suitability of floated access roads used for the Proposed Project Site align with the Scottish Executives Best Practice guidelines document. Some sections of the proposed access track are considered suitable for floated construction when the following criteria are met:

- Maximum slope in any direction is less than 5%,
- Peat depths are greater than 1m,
- The resulting drained and undrained slope stability assessment factor of safety results are greater than 1.3, without and with a 10kPa surcharge.

The main restricting criteria for floating roads at the Proposed Project site are the peat depth and slope angle, as many of the deep areas of peat are in short spans of access roadways, which can cause difficulties in creating adequate transition zones between founded and floated roads.

It is proposed that most of the new roads (7.6km, 76%) will be a founded construction (Detail A in Appendix C) with some sections of floated road (Detail B in Appendix C) suggested where the gradient and stability analysis results will allow (2.4km, 24%). A methodology and details are

provided for upgrading the existing founded and floated access roads (Detail C and D in Appendix C), as the existing roads will be upgraded and widened at the site.

General construction methodologies are presented in the following sections. This methodology aims to minimise impacts on the stability of the peat. These proposed methodologies will be informed by detailed design following further site investigation. The methodology is not intended to cover all aspects of construction, such as drainage and environmental considerations. Inspection and monitoring plans for each method will be implemented during construction to monitor peat stability.

4.1 Construction Methodology for New Roads

The general methodology to construct new founded roads (i.e. see Detail A of the road construction detail drawings in Appendix C) is presented below.

1. Excavation of the new access road to competent strata (see Section 3 for guidance on correctly handling and storing the different peat layers). Maximum excavation side slopes will be 1:1.5.
    a. Drainage shall be installed to divert surface and groundwater from the construction areas.
2. A layer of geogrid/geotextile may be required at the base of the excavation. To be confirmed at detailed design.
3. Placement of granular fill-in layers following the designer's specification. The fill thickness is 200mm above the existing ground level, which is required to backfill the excavation to a suitable competent strata below the existing ground level.
4. Access roads are to be finished with a granular running surface across the full width of the road.

The general methodology to construct new floating roads (i.e. see Detail B of the road construction detail drawings presented in Appendix C) is presented below.

1. A geotextile-geogrid composite layer is placed directly onto the peat surface following the designer's specification.
2. Placement of granular fill up to 800mm and reinforcing geogrids in layers following the designer's specification, with due regard to any settlement and deformation of peat anticipated at the access track.
    a. Cross-drains shall be installed within the road to divert surface and groundwater from upslope to downslope.
    b. Stone delivered to the floating road construction area shall be end-tipped onto the constructed floating road to avoid excessive impact loading on the peat due to concentrated end-tipping. Direct tipping of stone onto the peat shall not be carried out.
    c. Stone will be spread and placed from the constructed floating road onto the peat surface using a bulldozer.
3. Access roads are to be finished with a granular running surface across the full width of the road.

No excavations (e.g., drainage or peat cuttings) shall be carried out within 5m of a completed floated access road edge or at a distance determined following a site inspection by the Contractor's Geotechnical Engineer.

The presence of excavations can destabilise the road. Where required, for example, for the installation of internal cabling offset from the footprint of the floated road, temporary excavations will be excavated in short lengths and backfilled as soon as practicable. These works will be designed and supervised by the Contractor's Geotechnical Engineer.

Spoil materials can be used for landscaping along the edge of access road sections to aid with the enhancement of the peatland areas and embed the access roads into the surrounding environment where slope and ground conditions allow, limiting their ecological and environmental impact. Consideration must be given to the placement of excavated materials in areas of potential instability or additional mitigation requirements, as highlighted in the PSRA (GDG, 2023). Where permissible, excavated materials will be placed to a maximum height of 1m and stockpile widths of a minimum of 2 to 3m unless site-specific detail designs allow larger volumes to be placed. Large stockpiles of materials shall not be placed on or adjacent to floated access roads to avoid bearing failure of the underlying peat.

Peat placement or landscaping will be carried out only in areas where it is topographically contained and does not create a propagated landslide risk – see PSRA (GDG, 2023).

For this development, particular buffer areas, including construction buffers, have been highlighted in the PSRA (GDG, 2023) and are presented in Appendix A.

4.2 Construction Methodology to Upgrade Existing Roads

An indicative methodology to upgrade existing founded roads (i.e. see Detail C of the road construction detail drawings presented in Appendix C) is presented below.

1. Excavation on one or both sides of the existing access road to competent strata.
2. Placement of granular fill up to 200m above existing ground level and reinforcing geogrids in layers following the designer's specification, with due regard to any settlement and deformation of peat anticipated at the access track.
3. Overlay of the existing access road with selected granular fill following the designer's specification.
    a. Where coarse granular fill has been used in the existing floated access road make-up, a layer of geogrid will be placed on top of the existing floated access road.
4. Access roads will be finished with a granular running surface across the full width of the road.
    a. A layer of geogrid/geotextile may be required at the surface of the existing access road following the designer's specification.

An indicative methodology to upgrade existing floating roads (i.e. See Detail D of the road construction detail drawings presented in Appendix C) is presented below.

1. A geotextile is placed on one or both sides of the existing access road directly onto the peat surface, following the designer's specification.
2. Benching of existing road and placement of granular fill and reinforcing geogrids in layers following the designer's specification, with due regard to any settlement of peat anticipated for the widened area.

   a. It may be necessary to stage the widening to maintain peat stability – i.e., to reduce the fill placement rate to allow the peat layers to consolidate and increase in strength.
   b. It may be necessary to anchor the geogrids into the existing roads, requiring significant benching of existing roads.
3. Overlay of the existing access road with selected granular fill following the designer's specification.
   a. Where coarse granular fill has been used in the existing floated access road make-up, a layer of geogrid will be placed on top of the existing floated access road.
   b. The surface of the existing access road will be graded/levelled before the placement of any geogrid/geotextile, where necessary (to prevent damaging the geogrid/geotextile).
4. Access roads are to be finished with a layer of capping across the full width of the road.
   a. A layer of geogrid/geotextile may be required at the surface of the existing access road following the designer's specification.

Where there are cross slopes, any road widening works required will be carried out on the upslope side of the existing access road, where possible. Particular design details will be required at the detailed design stage at the transitions between floating and founded roads to reduce differential settlements between the two construction types.

4.3 Construction Methodology for Cable Trenches

The proposed 220kV cable route between the substation and the public road is considered as part of this PSMP with the cable route construction within the existing public road is not expected to generate any surplus peat. The cable route is proposed to be constructed within new access roads, varying in width from 3.5m to 6m, as proposed by MKO. Most of the route is proposed to be constructed within a new founded access road; however, part of the proposed route, totalling 460m, passes through an area of peat >1m in thickness. Therefore, it has been proposed that part of the route be constructed within a section of the floated access road (Figure 4-1).

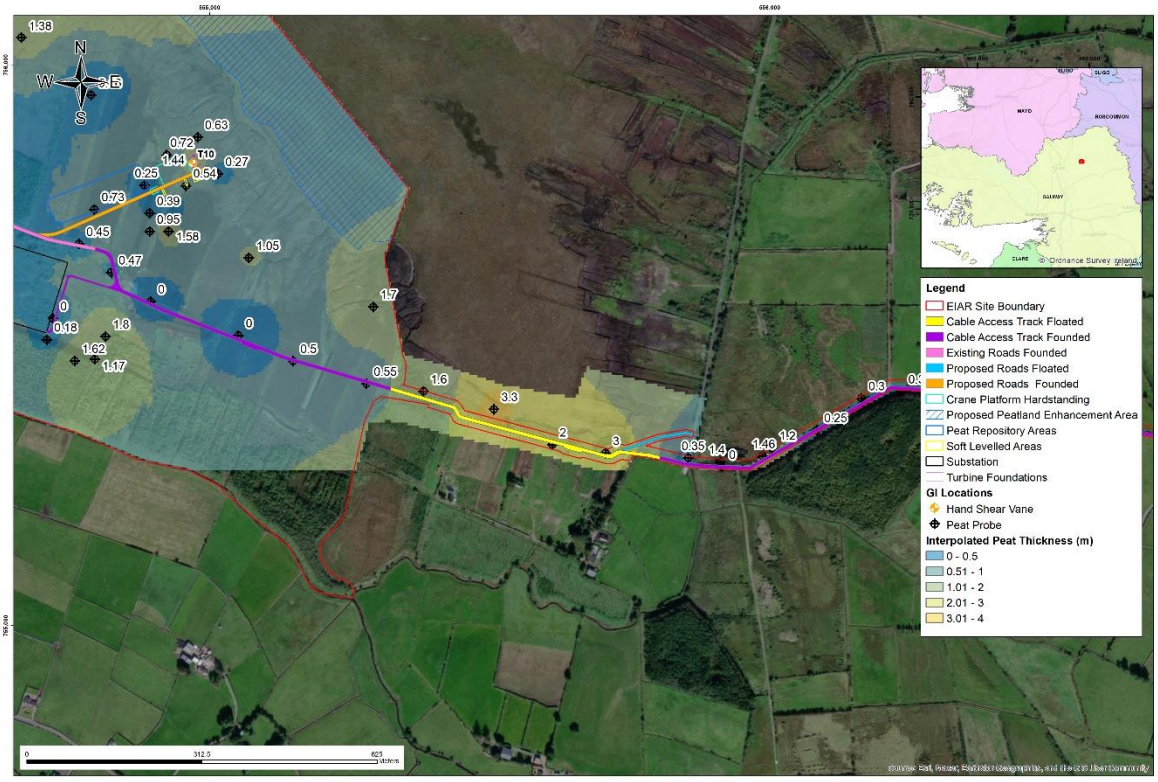


Figure 4-1: Location of floated cable sections.

An indicative methodology to construct cable trenches within new founded roads (i.e. see Detail 01 of the cable trench construction detail drawings in Appendix D) is presented below. It is recommended that the cable tenches are progressed ahead of the access tracks.

1. Excavation of the new access road to competent strata (see Section 3 for guidance on correctly handling and storing the different peat layers). Maximum excavation side slopes will be 1V:1.5H (subject to temporary works design).
    a. Drainage shall be installed to divert surface and groundwater from the construction areas.
2. Cable trenches are to be dug within the road footprint into the underlying bearing stratum to a suitable depth to allow installation of the ducting (as per the cable design requirements).
3. No more than a 50m section of trench is recommended to be opened at any one time. The subsequent 50m will only be excavated once most of the reinstatement has been completed on the preceding section.
4. Grade, smooth and trim the cable trench floor when the required excavation depth and width have been obtained.
5. A layer of geotextile is to be installed at the base of the trench excavation, overlapping with the geotextile layer (if required) at the interface between the access track's granular fill and the natural subgrade. The technical specification of the geotextile is to be confirmed at the detailed design stage.
6. The cable ducts shall be installed to the designer's specification and carefully surrounded and covered by rapid hardening wet concrete (grade C25/30) to specified depths. If the top

of the concrete is to be installed above the formation level of the access track, suitable formwork may be required to allow the proposed concrete cross-section to be formed.

7. A layer of geogrid may be required at the base of the the access track's granular fill. To be confirmed at detailed design.
8. Placement and compaction of access track fill shall be completed in layers following the designer's specification. The top of the access track is proposed to be 200mm above the existing ground level, with the remainder of the access track's fill thickness to backfill the excavation to a suitable competent strata below the existing ground level. The fill above the cable trench shall be upfilled with Clause 804 material (UGM-A as per Series 600 Specification, TII 2013), while the general fill either side of the Clause 804 is to be a Class 1 material.
9. Access roads are to be finished with a granular running surface across the full width of the road.

An indicative methodology to construct cable trenches beneath new floating roads (i.e. see Detail 02 of the cable trench construction detail drawings presented in Appendix D) is presented below. It is recommended that the cable tenches are progressed ahead of the floated access tracks to avoid damage and/or replacement of the geotextile and/or geogrid layers.

1. Bog matts or other temporary access solutions shall be placed on the insitu material as required.
2. Cable trenches are to be dug within the peat to a suitable depth to allow installation of the ducting (as per the cable design requirements). Peat will be excavated to the required depth and removed for placement in designated peat repository areas elsewhere on site.
3. No more than a 50m section of trench will be opened at any one time. The subsequent 50m will only be excavated once most of the reinstatement has been completed on the preceding section.
4. Grade, smooth and trim the cable trench floor when the required excavation depth and width have been obtained.
5. A geotextile-geogrid composite layer is to be installed at the base and around the sides of the trench excavation, directly onto the peat, as shown in Detail 02 in Appendix D, overlapping with the existing geotextile-geogrid composite layer at the base of the granular fill. The technical specification of the geotextile-geogrid composite layer is to be confirmed at the detailed design stage.
6. Ducts are to be installed to the designer's specification and carefully surrounded and covered by rapid hardening wet concrete (grade C25/30) to specified depths.
7. Placement and compaction of granular fill up to 800mm and installation of the reinforcing geogrids in layers following the designer's specification, with due regard to any settlement and deformation of peat anticipated at the access track.
    a. The fill above the cable trench shall be upfilled with Clause 804 material (UGM-A as per Series 600 Specification, TII 2013).
    b. The general fill either side of the Clause 804 is to be a Class 1 material.
    c. Cross-drains shall be installed within the road to divert surface and groundwater from upslope to downslope.

d. Stone delivered to the floating road construction area shall be end-tipped onto the constructed floating road in a manner that will avoid excessive impact loading on the peat due to concentrated end-tipping. Direct tipping of stone onto the peat shall not be carried out.
e. Stone will be spread and placed from the constructed floating road onto the peat surface using a bulldozer.

8. Access roads are to be finished with a granular running surface across the full width of the road.

Based on the available ground investigations and observed peat characteristics (Section 2.4), it is considered that cable trenches will be stable, provided the methodologies and best practice guidelines outlined in this report are followed. No additional excavations (e.g., drainage or peat cuttings) shall be carried out within 5m of a completed floated access road edge or at a distance determined following a site inspection by the Contractor's Geotechnical Engineer.

5 EXCAVATION OF TURBINE BASES, HARDSTANDINGS, AND INFRASTRUCTURE FOUNDATIONS

An assessment of the ground conditions encountered in the ground investigations indicates that the site's ground conditions are generally flat cut over raised peat bog, with some areas of glacial till. The average peat thicknesses identified at the proposed turbine and hardstand areas are less than 1m, except for T07, T08 and T11, where peat thicknesses are 3.5m, 1.7m and 1.7m, respectively. Where peat is present, the material encountered beneath it is generally a layer of soft to firm cohesive glacial till, or sandy gravelly granular glacial till. Generally, for constructing any structure or platform foundation, such as a turbine base, hardstand or substation, removing all soft material is required to a depth where a suitable bearing material is encountered. Rock breaking is not considered to be required at any turbine locations.

The non-peat excavated material must be properly managed and, as discussed in Section 2.1.1, will be assessed for reusability, and suitable granular material will be reused in other elements of the proposed wind farm design.

During turbine construction, peat will be excavated to a competent stratum for the concrete turbine foundation and a small working area surrounding the foundation footprint. Turbine bases of 25m in diameter are proposed, with detailed foundation design dictated by the local ground conditions and the requirements of the turbine supplier. A piled foundation is proposed at T7 due to the thick peat encountered (up to 5m), to be confirmed at the detailed design stage. Gravity foundations will be utilised at T1-T4 with precast piles the only alternative being considered at these locations . This foundation will require the excavation of peat and spoil to a sufficient depth to allow the installation of the piling platform beneath the concrete foundation.

The design of the turbine base foundations is subject to confirmatory ground investigation and assessment.

Similarly, all turbine crane hardstands will be founded on a suitable bearing material requiring the excavation of all peat and other soft ground materials, where present. The platform will be constructed in the excavated area using a suitable specified engineered stone fil. Following the placement of the platform, the excavated peat can be reused to batter the platform edges and landscape the platform back into the existing topography.

The mean peat depths collected from the ground investigations at each foundation and hardstanding location are used to calculate the estimated peat volumes. This is outlined further in Section 8.

6 AREAS PROPOSED FOR PEATLAND ENHANCEMENT

The proposed project includes an area of currently drained raised bog, used previously for turbary cutting, which is proposed to be enhanced by rewetting. This process aims to establish a hydrological regime that will allow for the resumption of peat accumulation in the area. This will allow the enhanced area to act better as a carbon sink.

The location of the proposed peatland enhancement area can be seen in Figure A-1-1 in Appendix A and Figure 6-1. The proposed area consists of a section of raised bog (maximum peat thickness from probes recorded at 3.88m, average peat thickness recorded at 2.8m), with parallel drains running NW to SE, roughly every 10-15m across the peat surface. The depth of the existing drains is estimated, based on site walkovers, to be between 0.5 m and 1m. Due to access constraints, only small sections of the area proposed for enhancement have been visited as part of this assessment. The current condition of the drained peat can be seen in Figure 6-2. Peat stability at this location has been assessed as part of the PSRA (EIAR Technical Appendix 8-1).

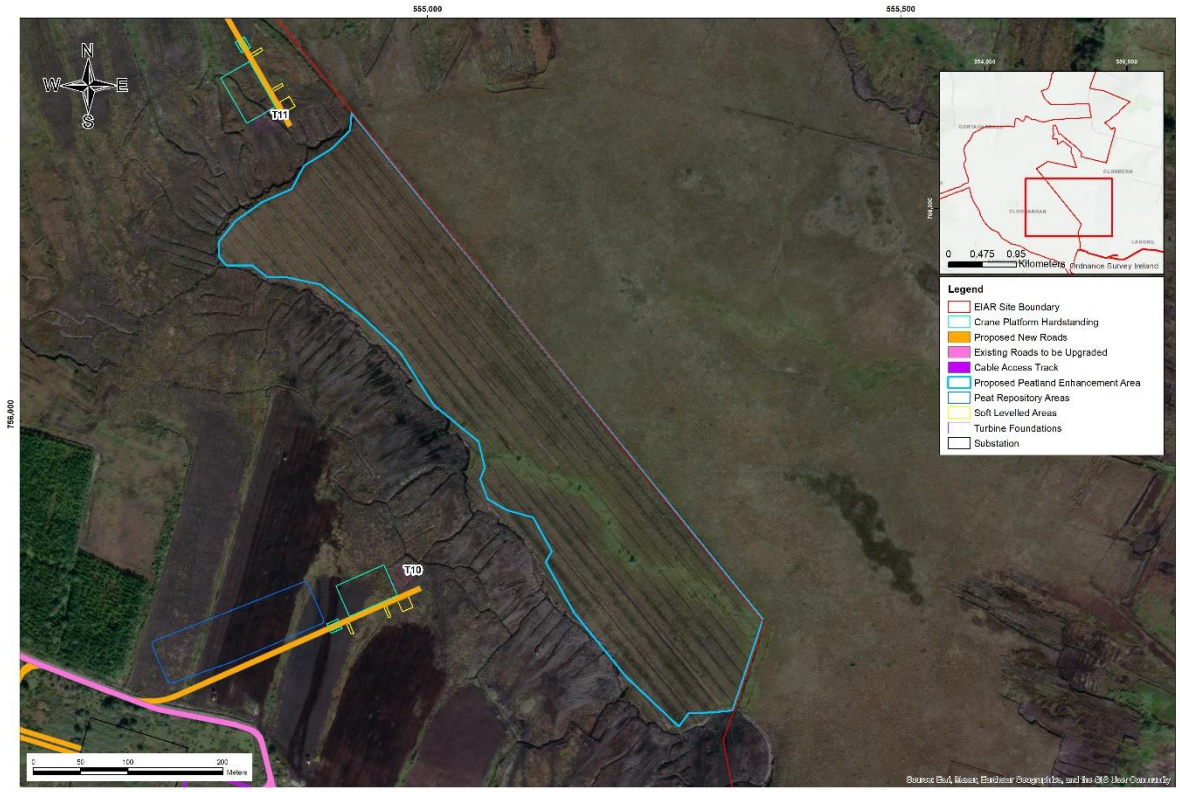


Figure 6-1: Location of the proposed peatland enhancement area.

Figure 6-2: Parallel drainage ditches at the north end of the proposed peatland enhancement area.

6.1 METHODOLOGY FOR PEATLAND ENHANCEMENT

In this instance, it is proposed that the peat will be rewetted by blocking the drains with peat dams being installed at the end of the drains and at 20m intervals along the drains, in line with the best practice outlined by Mackin et al. (2017) and McDonagh (1996). This will reduce drainage from the area and allow the water table to rise, allowing for peat accumulation to occur within the rewetted peat body.

The process involves clearing the drain and creating a 'key' in the drain sides to maintain a tight seal. The drain is subsequently blocked with small volumes of locally excavated acrotelmic peat by placing several layers of peat until it is built up to above the ground surface, after which it is covered with a 'scraw' (or sod) of vegetation. Depending on the surface conditions, this process may be carried out using a small excavator or by hand. The peat excavations adjacent to the peat dam locations will be limited in volume as far as possible. It is considered best practice to limit the number of dams to fewer than 10 per 100m to avoid excessive disruption to the peat surface. An example of a drain blocked by peat dams is illustrated in Figure 6-3 (adapted from Mackin et al., 2017).

Figure 6-3: Example of a peat dam at Moyarwood Bog, Co. Galway. Water table has risen to the surface within the drain, and in surrounding areas (Adapted from Mackin et al., 2017).

Peat excavated for use in constructing peat dams is proposed to be utilised entirely in the rewetting process, and as such is not considered in the peat balance calculations outlined in Section 8.

7 BORROW PIT

Excavation of a new borrow pit is proposed as part of the Proposed Project, as shown in Appendix A and E. A limited amount of overburden excavation will be required as part of the borrow pit excavation, as the area comprises up to 1m of overburden material. The peat depths within the development footprints of the borrow pits are estimated to be negligible and very limited peat excavation is expected (Figure 7-1). The overburden excavated from the borrow pit is proposed to be used for some reinstatement within the borrow pit once extraction is completed, with the remainder exported to a licensed waste facility over the course of the construction phase of the project.

The proposed borrow pit is to be excavated in an area of glaciofluvial sands and gravels, which have previously been the subject of extraction under a previous consent, revealing a bedrock outcrop. The bedrock comprises the Burren Formation, characterised by pale grey clean skeletal limestones.

Figure 7-1: Photo looking east across the proposed borrow pit, with no peat visible.

The excavated rock from the borrow pit will be used in the construction of the infrastructure elements (turbine bases, roads, etc.) at the Proposed Project. An example excavation profile

showing the profile through the proposed borrow pit is shown in Appendix E. Where necessary, the project design engineer will determine the appropriate excavation depth.

A preliminary assessment of the proposed borrow pit rock material by face geological mapping suggests that it is suitable for producing engineered fill and could be excavated by breaking or blasting and processed to the detailed design engineered fill requirements. The suitability and processing of the bedrock material will be subject to further GI and laboratory testing assessment at the detailed design stage to confirm the suitability and acceptability of the fill material for certain applications (e.g. Class 1C, 6N2, UGM-A, etc).

Slopes within the excavated rock formed around the perimeter of the pit borrow pit will be formed at stable inclinations to suit local in-situ rock conditions. It is proposed to excavate the borrow pit to 12m bgl. Where necessary, an interceptor drain will also be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit, preventing water from ponding and lodging in the borrow pit area. Groundwater management at the proposed borrow pit will be necessary to avoid ponding, and pumping will likely be required. The detailed design will need a drainage and groundwater management plan for the borrow pit area.

Upon removal of the overburden and rock from the proposed borrow pit, it is not proposed to reinstate the borrow pit using surplus excavated peat and spoil generated onsite during the construction of the Proposed Project. The final profile will vary across the base of the borrow pit. The volume assessment at the borrow pit suggests that the available stone fill capacity is lower than the stone requirements at the site, meaning that the import of stone from external sources will be required to complete the development.

An indicative layout of the proposed borrow pit is presented in Appendix E.

8 PEAT AND SPOIL VOLUMES

The ground investigation and design layout drawings have been reviewed to inform this section of the PSMP. Peat volumes can be estimated based on the results of intrusive investigations and the Proposed Project's design.

Peat excavation will be required for the following elements of the Proposed Project:

1. Founded and upgraded access roads;
2. Turbine hardstands and foundations (including crane pads);
3. Cable Trenches, and
4. Substation.

A preliminary estimate of the approximate volumes of excavation and fill needed to construct the Proposed Project was carried out. This was produced using typical limits to road and hardstand gradients and using road and hardstanding thickness typical to the ground conditions of the Proposed Project.

8.1 PEAT AND SPOIL EXCAVATION VOLUMES

The peat depths examined in the GI were reviewed at the infrastructural elements of the Proposed Project, such as each turbine, crane hardstand, borrow pit location and access tracks. The average peat depths at each structure were incorporated into the model along with the turbine and hardstand layout, access roads alignment and other associated infrastructures to estimate the volume of peat proposed to be excavated.

A breakdown of the estimated peat excavation volumes is summarised in Table 8-1.

Table 8-1: Summary of preliminary excavation volumes

Infrastructure Item	Approximate Area (m2)	Average Peat depth (m)	Excavated peat volume (m^3)*	Excavated spoil volume (m^3)
New Access Roads (founded)	56,100	0.3	16,060	350
Upgraded Access Road -including road to be widened (founded)	15,500	0.3	3,080	0
Cable Trenches	7,900	-	1,520	2,180
Turbine foundations	5,100	0.9	7,590	17,270
WTG Hardstands	23,300	0.7	18,480	0
Substation	13,600	0.2	3,520	13,830
Borrow Pit	20,000	0	**0**	14,456**
Total	**141,500**		**50,250**	**48,086**

* The volume of peat material excavated has been estimated using the average peat depth calculated across the footprint of the structure to define the basal surface of the peat.
** A small amount of spoil excavated from the borrow pit is proposed to be reinstated within the borrow pit, with the remainder proposed to be exported to a licensed waste facility over the course of the construction phase of the project. This volume is therefore not considered in the balance calculations below.

8.2 PEAT REINSTATEMENT VOLUMES

Peat generated during construction can be reused or reinstated across the development. Peat may be reused for landscaping on edges of constructed infrastructure (including road verges, around hardstand area and turbine foundations) and shall be placed as soon as reasonably practical after construction. This shall act as part of the landscaping Enhancement and tie in with surrounding topography, reducing visual impacts and restoring the existing habitat.

Several considerations have been made in the estimation of reinstatement volumes:

- A conservative reinstatement volume of $2m^3$ per linear metre (lin.m) of the new access road ($1m^3$ placed on each side of the trackway) has been used. This can often be increased to up to $4m^3$ per lin.m following the detail design stage and the appropriate stability design considerations,
- A conservative reinstatement volume of $1m^3$ per lin.m on existing access road widenings, accounting for placement of $1m^3$ on one side only side of the proposed widening trackway,
- A conservative reinstatement volume of $1m^3$ per lin.m on existing access road upgrades, accounting for placement of $0.5m^3$ on each side of the roads to be upgraded,
- An estimated reinstatement capacity of $3m^3$ per external lin.m perimeter of hardstand areas such as the crane hardstands and temporary construction compounds,
- A conservative estimate of 20% of the total cohesive spoil volumes has been considered as available for reuse in the construction of safety berms across the site.
- Four Peat Repository Areas and one Spoil Repository Area have been identified for the permanent placement of peat and spoil material.

Potential peat and spoil reuse/reinstatement volumes have been estimated and are also presented in Table 8-2 and Table 8-3.

Table 8-2: Summary of preliminary peat reinstatement volumes

Comment	Peat Reinstatement capacity volume (m^3)	Comments
New Access roads (founded)	13,270	Placement of arisings 2m^3/lin.m alongside existing and new founded roads, where topography allows.
New Access roads (floated)	3,190	
Upgraded Access roads (founded)	1,360	Placement of arisings 1m3/lin.m alongside upgraded roads, where topography allows..
Upgraded Access roads (floated)	170	
Turbine foundations and hardstands (11nr.)	5,050	Placement of arisings 3m^3/lin.m of external hardstand perimeter, where topography allows.
Compound (2nr)	1,290	Placement of arisings 3m^3/lin.m of external compound perimeter, where topography allows.
Substation	650	Placement of arisings 3m^3/lin.m of external substation perimeter, where topography allows.
Peat Repository Areas	30,500	1m peat placement within peat repository areas, with a reduction to account for constructing a 3m cell berm.
Total	**55,480**	

Table 8-3: Summary of preliminary spoil reinstatement capacity volumes

Comment	Spoil Reinstatement volume (m^3)
20% Reinstatement of Total Volume	6,740
Spoil Stockpile Areas	31,530
Total	**38,270**

The volumes quoted in Table 8-2 and Table 8-3 reflect normal earthworks practice where volumes of cut and fill are evaluated on a 1m^3 cut to 1 m^3 filled basis. It is acknowledged that bulking can occur where placed soils occupy a greater volume due to a reduction in density. It is considered that bulking will be offset to a considerable degree by the compaction of soils during placement and subsequent settlement to achieve the volumes outlined.

At the construction stage, the peat stability risk assessment will be updated to include consideration of the peat stability and landslide risks arising from variations to the layout which may occur during the construction stage.

A preliminary assessment has been undertaken to assess peat and spoil material placement and reinstatement. This assessment indicates that stability is acceptable. A detailed assessment must be undertaken as part of the detailed design when locations are confirmed and additional GI information becomes available.

The Contractor will conduct a confirmatory construction stage Peat Stability Risk Assessment to investigate the peat stability and landslide risks arising from variations to the layout that may occur during the detailed design and/or construction stage.

At this stage, no peat volume requirement has been identified for the peatland enhancement area, as it is considered that peat will be excavated from small excavations local to each peat dam and placed immediately. Alternatively, where the drain flows require it, plastic dams may be used. These excavations are, therefore, not considered as part of the overall peat balance.

8.3 PEAT BALANCE

The volume balance of excavated and reinstated peat is outlined in Table 8-4. This table outlines the estimated volumes of peat excavation and the reinstatement volumes as outlined in Sections 8.1 and 8.2.

Table 8-4: Peat and spoil balance assessment

ITEM	SUPPLY	DEMAND	BALANCE
	Excavation Volume (m^3)	Reinstatement Capacity (m^3)	Surplus (+) or Deficit (-) (m^3)
Peat Balance	50,250	55,480	-5,230
Spoil Balance	33,630*	38,270	-4,640
TOTAL	**83,880**	**93,750**	**-9,870**

*The 14,456m^3 excavated from the borrow pits is not proposed to be managed on-site and so is excluded from this calculation. The total volume of spoil to be managed on-site is 33,630m^3.

The preliminary earthwork volume summary indicates that the development's peat and spoil placement capacity, provided once the peat repository areas are reinstated, exceeds the volume of peat excavated for the various infrastructures.

The summary of earthwork volumes indicates that the peat placement capacity of the Proposed Project Site is greater than the volume of peat excavated for the various infrastructures.

9 GUIDELINES FOR GOOD CONSTRUCTION PRACTICE

9.1 GENERAL

Inappropriate handling and management of excavated peat and overburden and uncontrolled loading of peat material are two of the leading causes of peat instability and landslide event triggers during the wind farm construction process. Managing and controlling these activities is key to de-risking peat stability at the wind farm site. It is required that the construction method statements for the project also consider, but are not limited to, the guidance documents listed in Section 1 and the recommendations and requirements outlined throughout this document.

The general requirements for the management of peat and spoil materials and the mitigation of peat instability at the site:

- A Project Geotechnical Engineer shall be appointed to oversee peat excavation and management for the construction stage.
- Placement of peat material, including temporary and side casting, shall be carried out in the permitted areas only. No peat material shall be stored, side cast, or used for landscaping in the designated Safety Buffer Areas,
- Excavated peat shall not be stored on-site and will be immediately moved to the designated peat repository areas. Acrotelm (upper) peat material will be used as landscaping material where topography allows, and the detail designer has assessed the stability risk,
- Peat and spoil will only be placed in the proposed repository areas or reused for landscaping. The velocity of water flows within drainage systems will be controlled using check damns, and the uncontrolled release of water onto slopes can create a landslide risk and must be avoided,
- All construction requiring cut and fill earthworks requires a robust monitoring and inspection programme. The details of this inspection programme will depend on the purpose and methodologies of the works and the ground conditions,
- A method statement and risk assessment (RAMS), which considers the potential causes and mitigations of peat instabilities and landslides, is required and shall be regularly communicated to all site staff. An observational approach by all site staff to the ground conditions and the risks will be promoted, and any changes in the ground or site conditions will be reported and the risk dynamically assessed.
- Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting any observed change in ground conditions.

9.2 MONITORING

Installing movement monitoring posts is recommended for areas where works occur on or adjacent to identified peat depths greater than 2m and existing slope angles exceeding five degrees. At those locations, monitoring posts are recommended to be installed upslope and downslope of the works areas.

Movement monitoring posts shall be observed at least once daily during construction, with more frequent inspections where adjacent works are ongoing. Should movements be recorded, the frequency of these inspections is to be increased. A record of all monitor post inspections will be kept with reference to date, time and relative movement between posts, if any. Any movement

identified in the posts shall be recorded with reference to the post numbering system. The monitoring regime will be further developed and assessed during the detailed design phase.

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

9.3 CONTINGENCY MEASURES

The stability of the peat and overburden is considered safe for the construction activities proposed, and providing the peat and spoil are managed in line with the details of this document, the risk of a peat failure or landslide is negligible to very low. However, it is important to consider the actions that will be carried out if signs of instability are identified during the outlined monitoring or if a failure occurs at the site.

The full methodologies for these activities will be outlined in the construction Contractor's RAMS and include the methodologies for immediate and long-term response.

9.3.1 MOVEMENT OR INSTABILITY OBSERVED IN MONITORING AREAS

Where excessive movement has been observed in the installed monitoring outlined in 9.2 the following measures will be taken;

- All construction activities will be suspended in the area,
- The Contractor's Geotechnical Engineer shall assess the peat instability, including drainage. The Contractor's Geotechnical Engineer will compile a report outlining the surveys undertaken, the potential cause of the instability, the assessment of any increased risk caused by the instability, and the further measures required to manage this risk.
- An increased monitoring regime will be specified, including an increase in the number of monitoring post lines, a decrease in monitoring post spacing and an increase in the frequency of monitoring post observations.
- Providing no further movement is detected, construction activities will be recommenced while maintaining the increased monitoring regime.
- Should further excessive movement be detected, the contractor's design and project geotechnical engineer will be informed, and the design of further reinstatement works will occur, such as excavation of the disturbed material, installation of granular berms or similar.

9.3.2 EMERGENCY RESPONSE TO A LANDSLIDE EVENT

In the scenario of a landslide, bog burst or peat slide at the site, the following steps will be carried out by the Contractor:

- All project members will be alerted immediately or as soon as it is safe.
- All site works will be ceased, and all available resources will be used to manage and mitigate the risks posed by the event.
- The key initial activity will be to prevent displaced materials from reaching any watercourses or sensitive environments. Given the terrain of the Proposed Project site, the key risk is the development of a bog burst in proximity to watercourses. Where possible, check barrage

structures on land or within these watercourses, which will be constructed to minimise further runout of the disturbed peat or spoil material.

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

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

The use of check barrages is only proposed for use in the unlikely event of a large bog burst event. The Contractor will include an assessment of potential check barrage locations and method for their construction within the emergency procedures in their associated RAMS documentation.

10 RISK REGISTER

Table 10-1: Risk register.

Ref.	Risk	Cause	Mitigation
1	Excavation of larger quantities of peat than expected	Increase in peat depth encountered	This report outlines the calculations carried out in the peat balance exercise. The report outlines the volumes of peat excavation required for the construction of the Proposed Project and the capacity for the development for peat placement or rehabilitation, concluding that the peat balance is satisfactory for the construction of the Proposed Project. The peat depths used are developed from the ground investigations carried out at the site including peat probes, trial pits and hand shear vanes. Peat material can vary largely locally and the risk of missing a local deep area of peat can exist at the site. An increased density of ground investigation was carried out in the areas of proposed infrastructure. However, some areas had limited or no access and so ground investigations are limited. A conservative estimate of peat volumes has been taken into account in the volumes presented in Section 8. Road construction types have been considered based on a threshold of minimum 1m peat thickness for floated roads. If further GI chsnges the peat thickness calculation in areas proposed for floated road construction, or if this threshold is altered, then the pear excavation may change accordingly. Further GI will be required across the Proposed Project during the detail design and construction stage to assess peat depths and strengths. This will be carried out by the detail designer and Contractors team. The design team will develop their own peat balance calculation to satisfy and de-risk the possibility of larger peat excavation volumes being encountered at these locations.
2	Inadequate repository space for excavated peat	Inadequate peat reinstatement volumes	The peat balance calculation has considered a conservative estimate of the peat reinstatement quantities. Following detailed design it is likely that the reinstatement volumes will be able to be increased, targeting topographically confined areas for increased volume of side casting while still remaining in compliance with the requirements outlined in this Peat and Spoil Management Plan document and industry best practices. It is assumed that a suitable construction methodology and project timeline can be developed by the construction stage contractor and design team to manage peat excavations and placement areas effectively.
3	Peat slippage from side casting of	Overloading of in-situ peat by sidecasting	The PSRA report (EIAR Technical Appendix 8-1) examines the stability of the peat in several conditions, including the inclusion of a 1m peat placement surcharge. GI has been carried out, providing peat thicknesses at 229 locations,

Ref.	Risk	Cause	Mitigation
	peat material		and GDG is satisfied that the design at this stage is in line with the Scottish Guidelines for development on peatlands (Section). This report outlines the methodologies to safely carry out the construction of the Proposed Project, including the restriction for the placement of peat at some key infrastructure locations. The construction stage design and contractor team will need to construct the Proposed Project using these mitigation measures. Further confirmatory GI will be required across the full site including at the identified hazard areas during the detail and construction stage to assess peat depths and strengths. This will be carried out by the detailed designer and contractor's team. The design team shall develop their own testing criteria to satisfy and de-risk the possibility of instability and peat failure. The works will be undertaken by a competent contractor experienced in working in peat and soft ground conditions in upland areas and will have carried out the appropriate due diligence and assessment relating to peat stability and appropriate peat placement.

11 CONCLUSION

This PSMP has been prepared to outline a Peat and spoil management strategy to ensure the workable and sustainable management of peat during the construction of the Proposed Project.

This PSMP indicates that the majority of material excavated will comprise peaty soil and acrotelmic peat, with some excavations of catotelmic peat. The volumes of catotelmic peat generated will be fully utilised in the peat repository areas and are not considered to represent waste material.

For the purposes of the peat balance assessment completed herein, volumes of peaty soil have been included to facilitate an assessment of the superficial material required for enhancement and infrastructure dressing at the Proposed Project.

The peat balance analysis in Section 8 outlines a conservative estimate of the volumes of peat and spoil excavation and reinstatement during the construction of the Proposed Project, and as such, it is concluded that all of the peat material excavated can be reused safely on-site during construction. Should further refinement of the detailed infrastructure design be undertaken, the assessment completed herein will be revisited.

REFERENCES

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Appendix A -Site Maps

A.1 Site Layout and Peat Thickness Plans

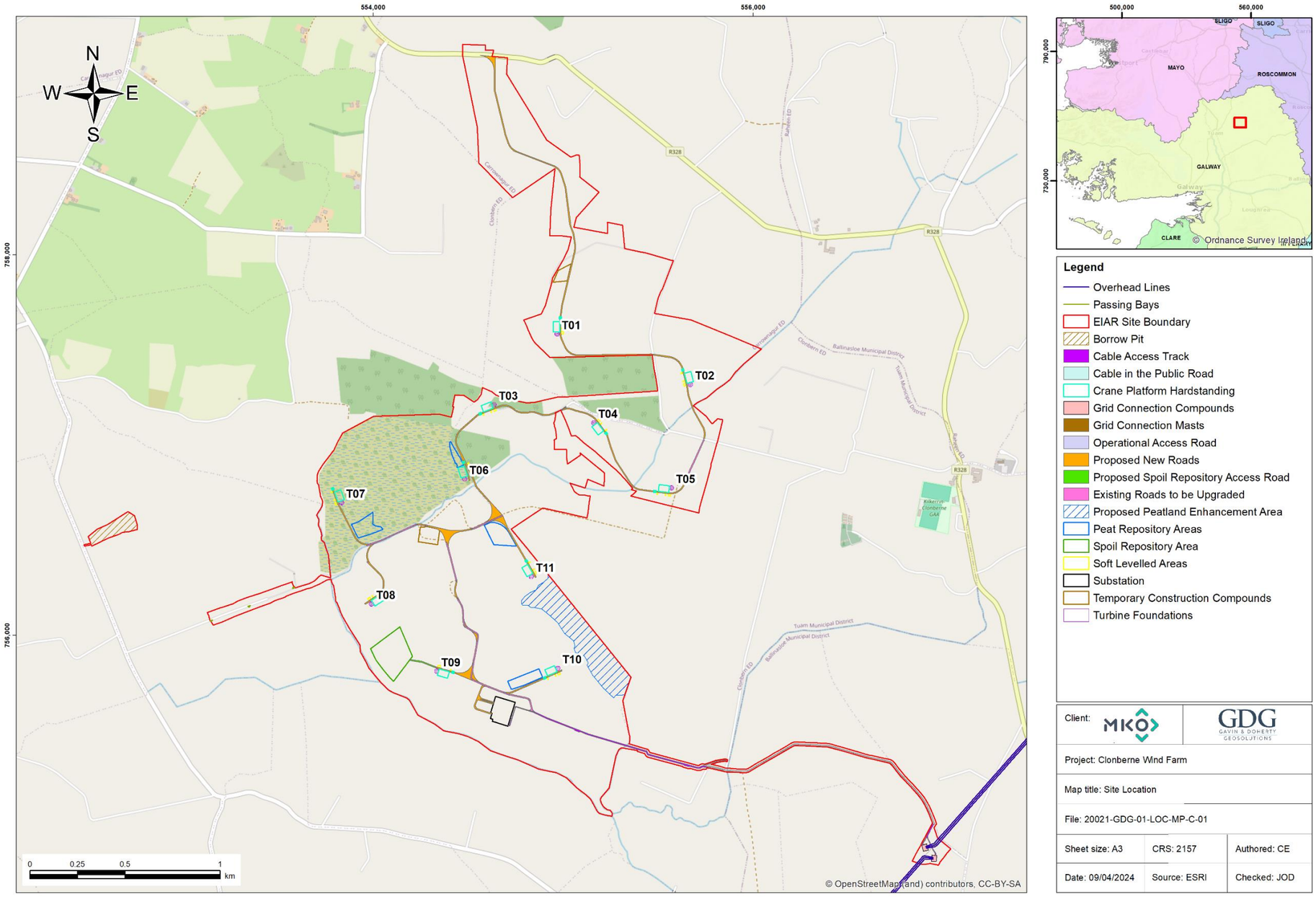


Figure A-1-1: Site Layout

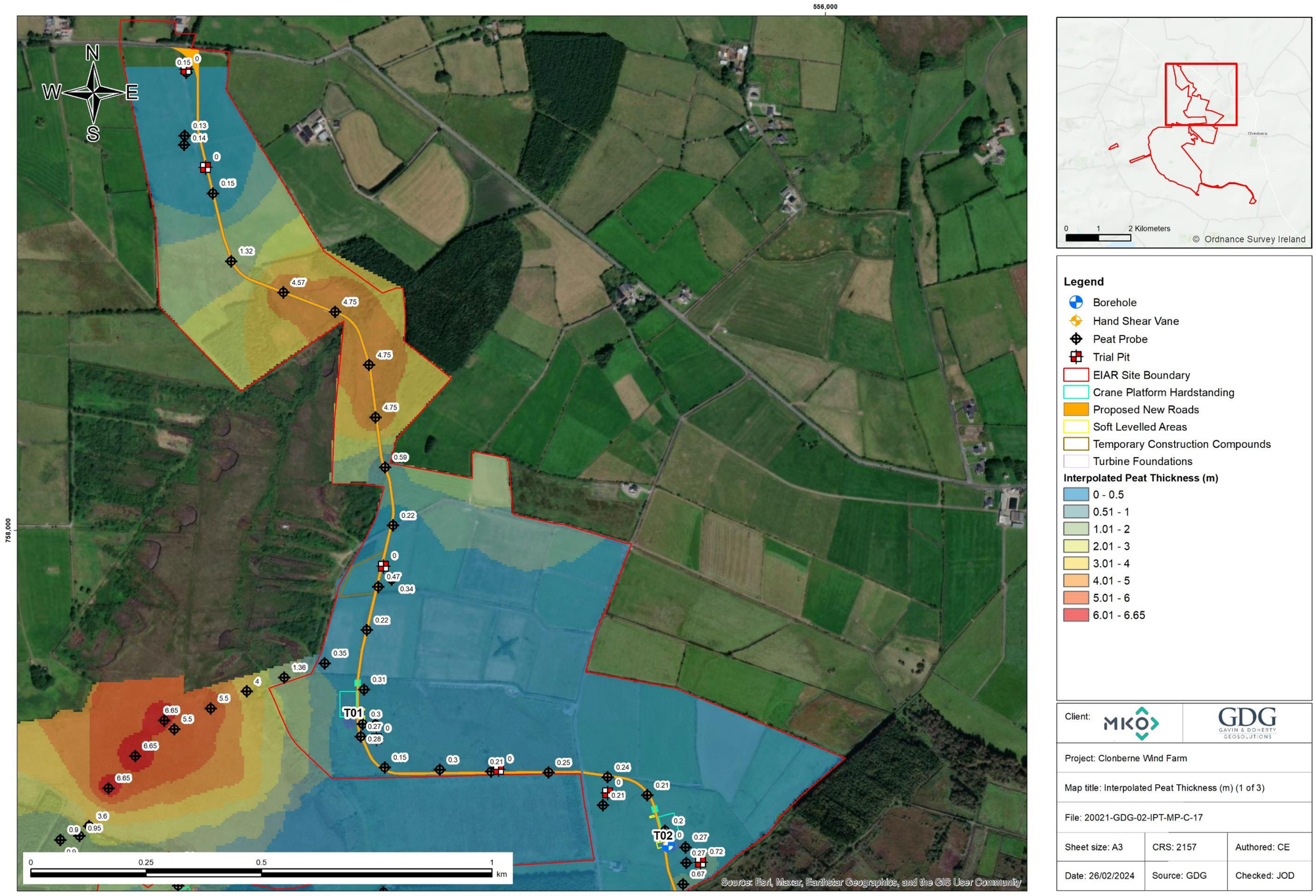
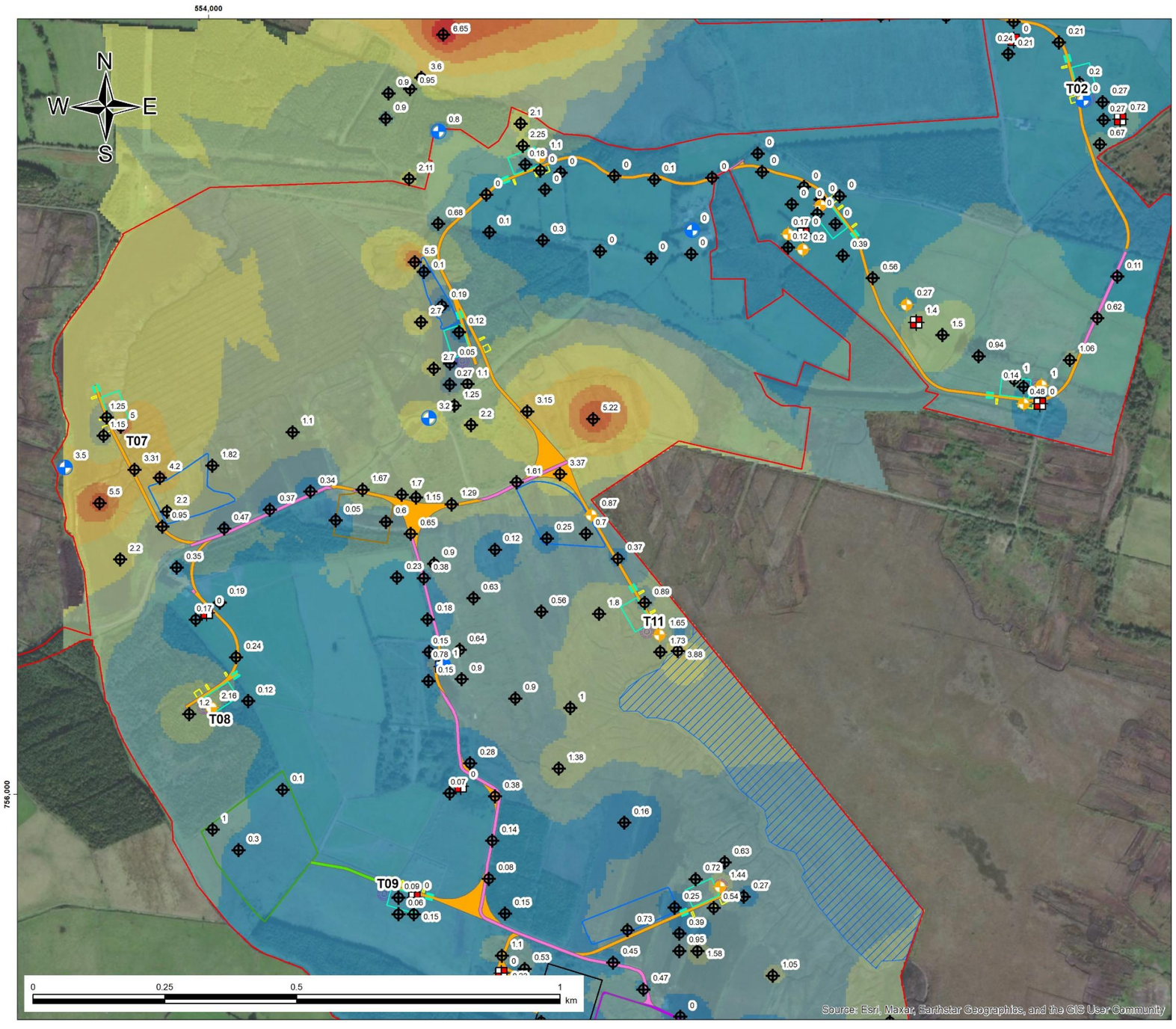
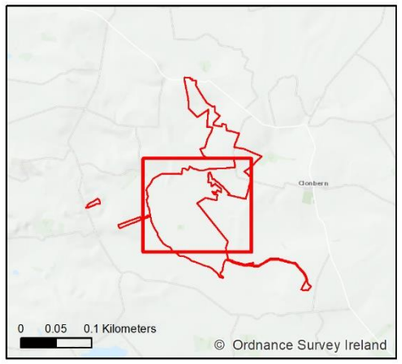


Figure A-1 2: Interpolated Peat Thickness (1 of 3).





Legend

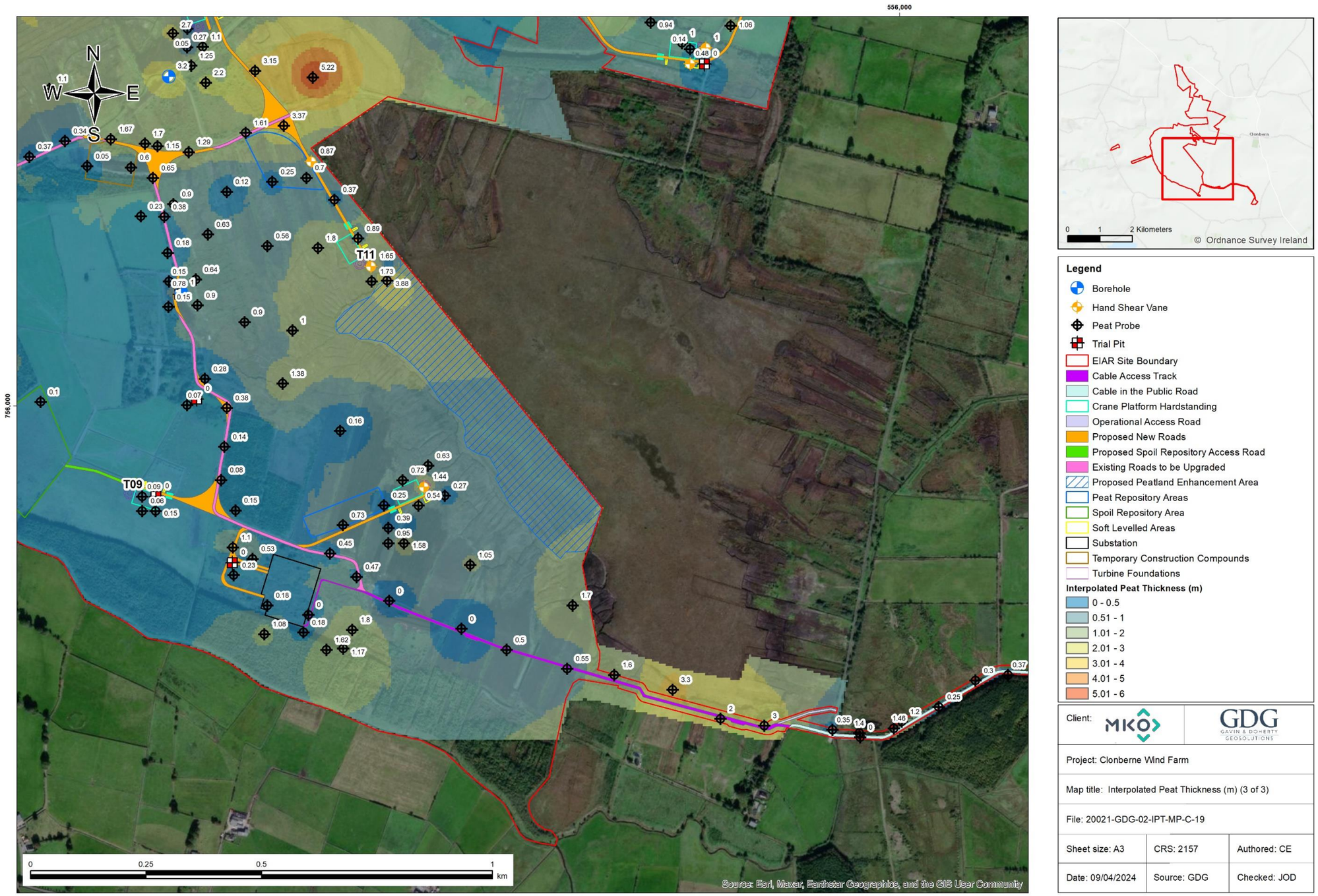
- Borehole
- Hand Shear Vane
- Peat Probe
- Trial Pit
- EIAR Site Boundary
- Cable Access Track
- Crane Platform Hardstanding
- Proposed New Roads
- Proposed Spoil Repository Access Road
- Existing Roads to be Upgraded
- Proposed Peatland Enhancement Area
- Peat Repository Areas
- Spoil Repository Area
- Soft Levelled Areas
- Substation
- Temporary Construction Compounds
- Turbine Foundations

Interpolated Peat Thickness (m)

- 0 - 0.5
- 0.51 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
- 5.01 - 6
- 6.01 - 6.65

Client: MKO	GDG GAVIN & DOHERTY GEOSOLUTIONS	
Project: Clonberne Wind Farm		
Map title: Interpolated Peat Thickness (m) (2 of 3)		
File: 20021-GDG-02-IPT-MP-C-18		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 09/04/2024	Source: GDG	Checked: JOD

Figure A-1-3: Interpolated Peat Thickness (2 of 3).



Legend

- Borehole
- Hand Shear Vane
- Peat Probe
- Trial Pit
- EIAR Site Boundary
- Cable Access Track
- Cable in the Public Road
- Crane Platform Hardstanding
- Operational Access Road
- Proposed New Roads
- Proposed Spoil Repository Access Road
- Existing Roads to be Upgraded
- Proposed Peatland Enhancement Area
- Peat Repository Areas
- Spoil Repository Area
- Soft Levelled Areas
- Substation
- Temporary Construction Compounds
- Turbine Foundations

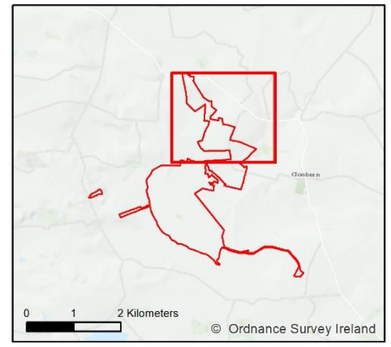
Interpolated Peat Thickness (m)

- 0 - 0.5
- 0.51 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
- 5.01 - 6

Client: MKO	GDG GAVIN & DOHERTY GEOSOLUTIONS	
Project: Clonberne Wind Farm		
Map title: Interpolated Peat Thickness (m) (3 of 3)		
File: 20021-GDG-02-IPT-MP-C-19		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 09/04/2024	Source: GDG	Checked: JOD

Figure A-1-4: Interpolated Peat Thickness (3 of 3).

A.2 Safety Buffer and Peat Stockpile Restriction Map



Legend

- Peat Stockpile Restriction Areas
- EIAR Site Boundary
- Crane Platform Hardstanding
- Proposed New Roads
- Soft Levelled Areas
- Temporary Construction Compounds
- Turbine Foundations

Client: MKO / GDG		
Project: Clonberne Wind Farm		
Map title: Safety Buffer and Peat Stockpile Restriction Areas (1 of 3)		
File: 20021-GDG-02-SBZ-MP-C-32		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 26/02/2024	Source: GDG	Checked: JOD

Figure A-2-1: Safety buffers and peat stockpile restriction zones (1 of 3).

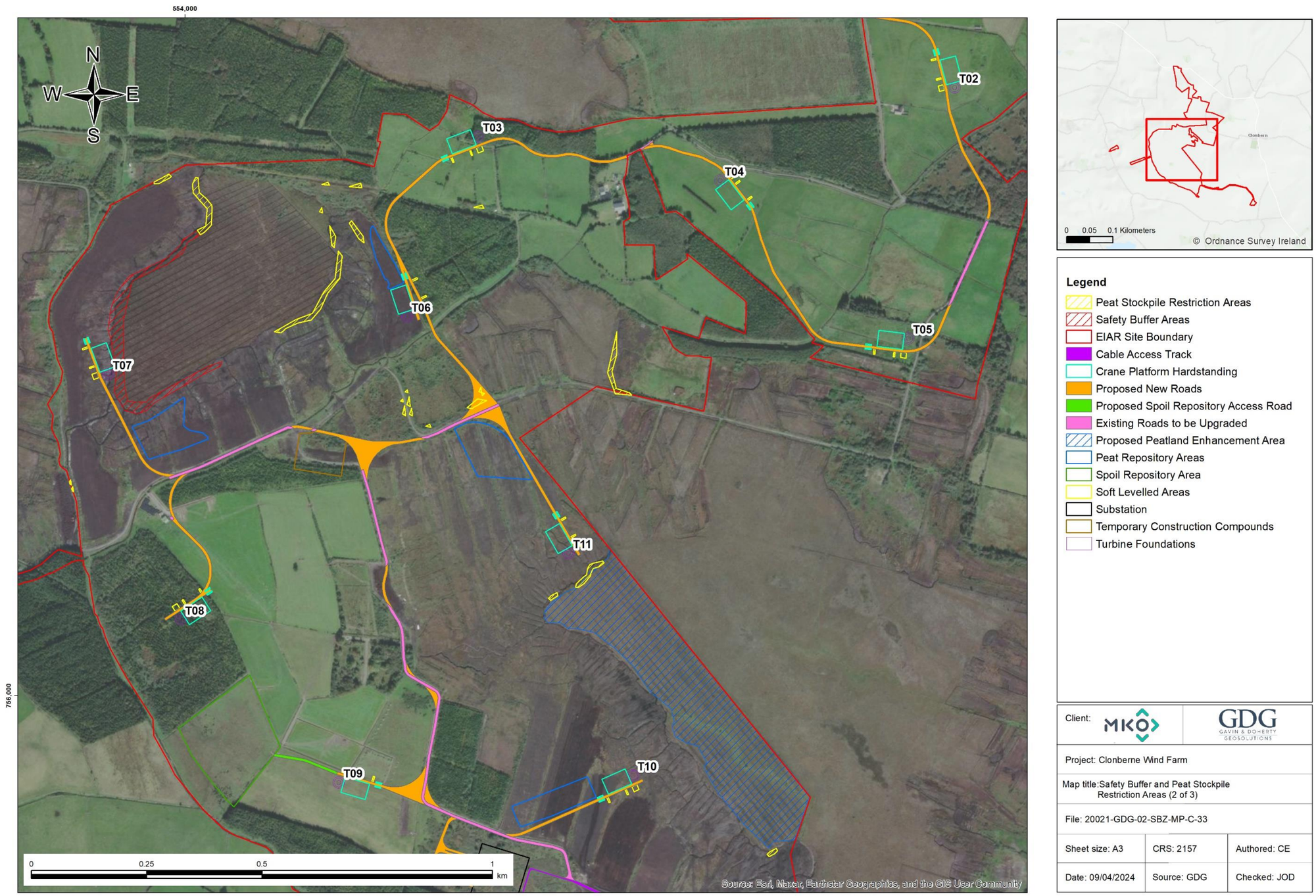
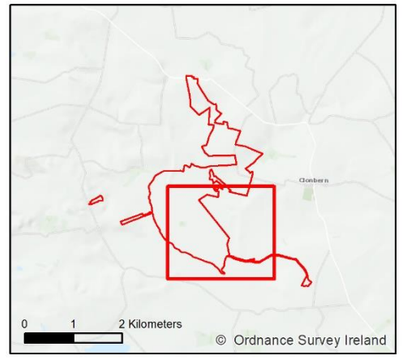


Figure A-2-2: Safety buffers and peat stockpile restriction zones (2 of 3).



Legend

- Peat Stockpile Restriction Areas
- EIAR Site Boundary
- Cable Access Track
- Cable in the Public Road
- Crane Platform Hardstanding
- Operational Access
- Proposed New Roads
- Proposed Spoil Repository Access
- Existing Roads to be Upgraded
- Proposed Peatland Enhancement
- Peat Repository Areas
- Spoil Repository
- Soft Levelled Areas
- Substation
- Temporary Construction Compounds
- Turbine Foundations

Client: MKO / GDG GAVIN & DOHERTY GEOSOLUTIONS		
Project: Clonberne Wind Farm		
Map title: Safety Buffer and Peat Stockpile Restriction Areas (3 of 3)		
File: 20021-GDG-02-SBZ-MP-C-34		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 09/04/2024	Source: GDG	Checked: JOD

Figure A-2-3: Safety buffers and peat stockpile restriction zones (3 of 3).

A.3 ROAD CONSTRUCTION TYPES

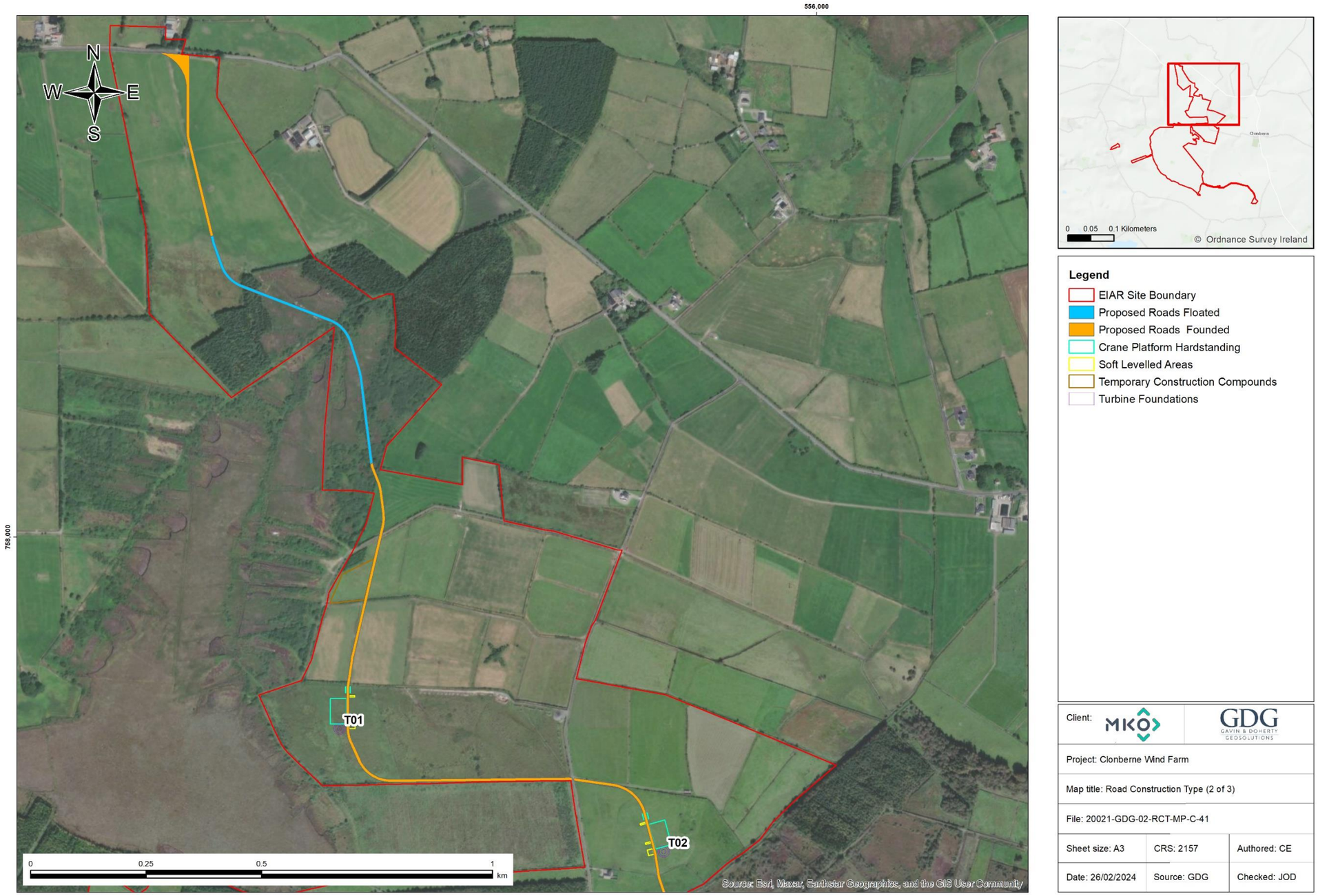
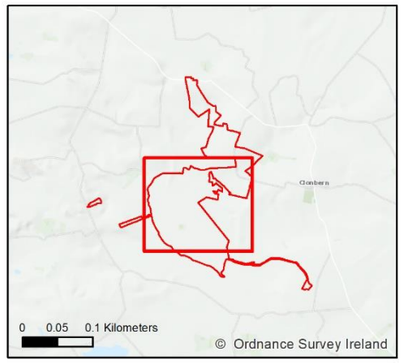


Figure A-3-1: Proposed road construction types (1 of 3).



Legend

- EIAR Site Boundary
- Cable Access Track Founded
- Existing Roads Floated
- Existing Roads Founded
- Proposed Roads Floated
- Proposed Roads Founded
- Crane Platform Hardstanding
- Proposed Spoil Repository Access Road
- Proposed Peatland Enhancement Area
- Peat Repository Areas
- Spoil Repository Area
- Soft Levelled Areas
- Substation
- Temporary Construction Compounds
- Turbine Foundations

Client: MKO / GDG GAVIN & DOHERTY GEOSOLUTIONS		
Project: Clonberne Wind Farm		
Map title:: Road ConstructionType (2 of 3)		
File: 20021-GDG-02-RCT-MP-C-41		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 09/04/2024	Source: GDG	Checked: JOD

Figure A-3- 2: Proposed road construction types (2 of 3).

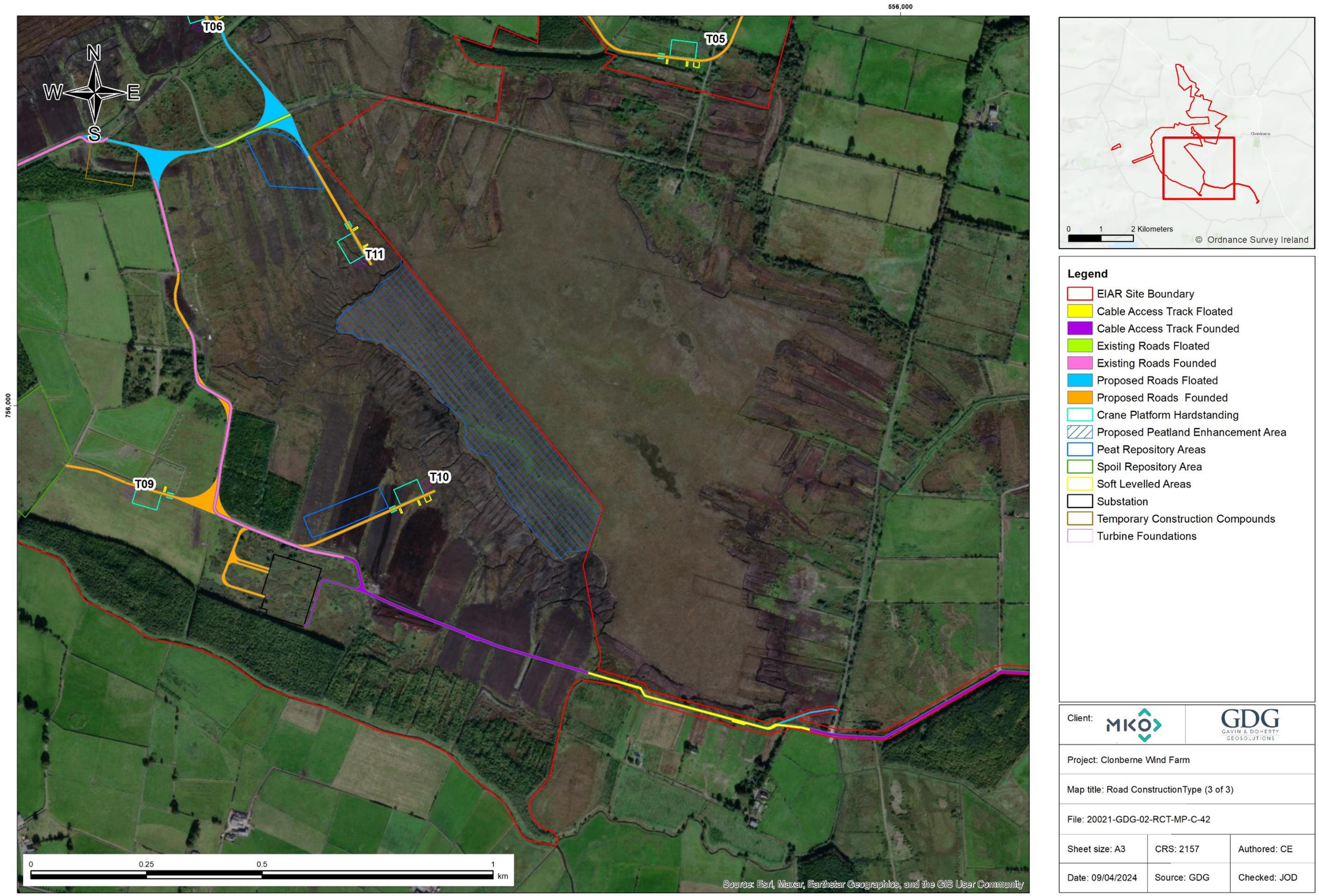


Figure A-3- 3: Proposed road construction types (3 of 3).

A.4 TRIAL PIT LOGS

GDG
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GEOSOLUTIONS

Trial Pit Log

TrialPit No
TP-01
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 553996.00 - 756344.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.50	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							TOPSOIL (grassland)
				0.20			Grey brown, stiff, high plasticity, sandy, gravelly CLAY.
				0.50			Light brown, loose to medium dense SAND with many cobbles and large boulders. Boulders and cobbles are rounded to subrounded.
▼							
				2.50			End of Pit at 2.50m

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Remarks:

Stability:

AGS

GDG GAVIN & DOHERTY GEOSOLUTIONS

Trial Pit Log

TrialPit No: TP-02
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554555.00 - 755661.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 3.55	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Peaty TOPSOIL with rootlet.
				0.29			Grey brown, stiff, sandy, gravelly CLAY with some cobbles.
				0.67			Light brown, loose to medium dense slightly clayey, gravelly SAND with cobbles. Gravel and cobbles are rounded to subrounded.
				1.60			Grey, dense, gravelly, silty, fine to coarse SAND with large cobbles and boulders subrounded to subangular.
				3.55			End of Pit at 3.55m

Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No
TP-03
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554478.00 - 756015.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 3.00	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.13			Brown TOPSOIL with rootlet.
				0.35			Brown, soft, medium plasticity, gravelly, very sandy CLAY.
				0.71			Grey, stiff, high plasticity, sandy, gravelly CLAY with boulders.
				3.00			Grey/brown loose to medium clayey/silty coarse SAND with large cobbles and boulders subrounded to subangular.
							End of Pit at 3.00m

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Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No: TP-04
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555527.00 - 757431.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m): Depth 1.20	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)			Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.17			Dark/brown TOPSOIL with rootlet.
				0.84			Dark grey , slightly silty, very sandy GRAVEL, with cobbles subrounded to rounded.
				1.20			Dark/grey very sandy GRAVEL with angular boulders and cobbles.
							End of Pit at 1.20m

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Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No
TP-05
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554441.00 - 756242.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.10	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Black/brown fibrous PEAT.
				0.56			Brown pseudo fibrous slightly clayey PEAT.
				0.78			Grey, firm to stiff, high plasticity, sandy, very gravelly CLAY. Gravel is subrounded to subangular. At 1.2 mBGL many cobbles and boulders.
				2.10			End of Pit at 2.10m

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Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No: TP-06
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555026.00 - 757548.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.30	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25			Dark brown TOPSOIL with rootlet.
				0.72			Grey, stiff, medium strength, sandy, very gravelly CLAY.
				2.30			Dark grey soft, low strength, gravelly sandy, slightly clayey SILT with cobbles and boulders. Cobbles are gneiss angular, block with veins of quartz. End of Pit at 2.30m

Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No: TP-07
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555729.00 - 757280.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m): Depth 2.80	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)			Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			TOPSOIL.
							Dark brown pseudo fibrous PEAT.
				0.72			Creamy grey, slightly organic, sandy, gravelly, silty CLAY with high cobble content. Cobbles are subrounded to subangular. Sandy lense at 1.6m.
▼				2.80			End of Pit at 2.80m

1 2 3 4 5

Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No: TP-08
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555128.00 - 757063.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.60	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							TOPSOIL (grassland).
				0.25			Grey, firm, sandy, gravelly CLAY.
▼				0.52			Light brown, medium dense to dense, silghtly silty, very gravelly, fine to coarse SAND, with many cobbles and boulders. Cobbles and boulders are rounded to subrounded.
				2.00			Grey, silghtly sandy GRAVEL with cobbles and boulders. Cobbles and boulders are angular to subangular (possible weathered bedrock).
				2.60			End of Pit at 2.60m

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Remarks:

Stability:

AGS

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GEOSOLUTIONS

Trial Pit Log

TrialPit No
TP-09
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555577.00 - 756741.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.80	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			TOPSOIL (grassland)
							Greyish brown, firm, slightly gravelly, sandy CLAY with some cobbles. Cobbles are subrounded to subangular.
▼				0.80			Brownish grey high plasticity sandy gravelly silty CLAY.
				2.10			Light grey, slightly clayey, slightly silty, sandy GRAVEL with cobbles and boulders (possible weathered bedrock).
				2.80			End of Pit at 2.80m

1 2 3 4 5

Remarks:

Stability:

AGS

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GEOSOLUTIONS

Trial Pit Log

TrialPit No
TP-11
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554390.00 - 755804.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.90	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Brown peaty TOPSOIL with rootlets.
				0.38			Brown/grey firm sandy gravelly CLAY with cobbles and boulders. Cobbles and boulders are subangular to subrounded.
				1.12			Dark grey/blue, soft, high plasticity, slightly sandy, gravelly CLAY.
				2.90			End of Pit at 2.90m

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Remarks:

Stability:

AGS

GDG GAVIN & DOHERTY GEOSOLUTIONS

Trial Pit Log

TrialPit No: TPr-01
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554655.00 - 758787.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.80	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			TOPSOIL (grassland)
							Brown, firm, sandy, gravelly CLAY with cobbles. Cobbles are subrounded to subangular.
				0.70			Light grey, medium dense to dense, silty, sandy GRAVEL with large cobbles and boulders. Boulders and cobbles are angular to subrounded.
▼				2.80			End of Pit at 2.80m

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Remarks:

Stability:

AGS

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GEOSOLUTIONS

Trial Pit Log

TrialPit No
TPr-02
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555041.00 - 757922.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.25	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			TOPSOIL (grassland)
				1.10			Brown firm to stiff sandy gravelly CLAY with some cobbles.
				2.25			Grey medium dense, sandy, silty GRAVEL with many cobbles. Cobbles are angular to subangular.
							End of Pit at 2.25m

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Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No: TPr-03
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555291.00 - 757482.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m): Depth 2.10	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)			Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.23			Dark brown TOPSOIL with rootlets.
				0.90			Dark grey medium dense sandy gravelly SILT with cobbles and boulders.
				2.10			Grey brown, very soft, low strength, sandy, gravelly CLAY with cobbles and boulders.
							End of Pit at 2.10m

1 2 3 4 5

Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No
TPr-05
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555342.00 - 756895.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 3.05	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
▼							Dark brown fibrous PEAT with rootlets.
				1.40			Grey stiff high strength CLAY.
				3.05			End of Pit at 3.05m

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Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No
TPr-06
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554613.00 - 759000.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.80	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			TOPSOIL (grassland)
							Brown to light brown sandy gravelly CLAY with cobbles and some boulders. Cobbles are subrounded to subangular.
				2.80			End of Pit at 2.80m

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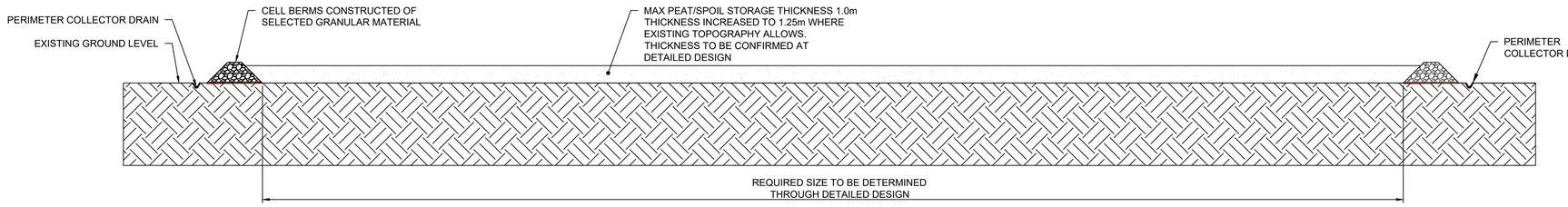
Remarks:

Stability:

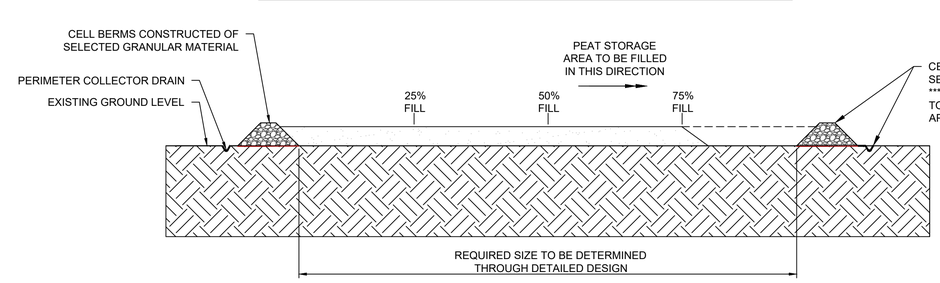
AGS

Appendix B PEAT AND SPOIL REPOSITORY DETAILS



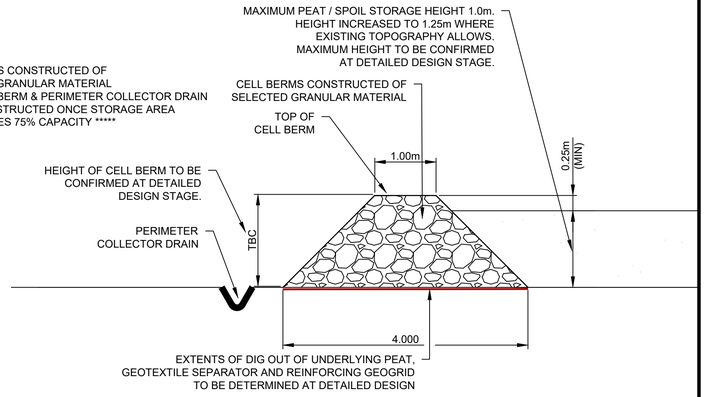
PEAT / SPOIL STORAGE - TYPICAL SECTION A-A

SCALE 1:200



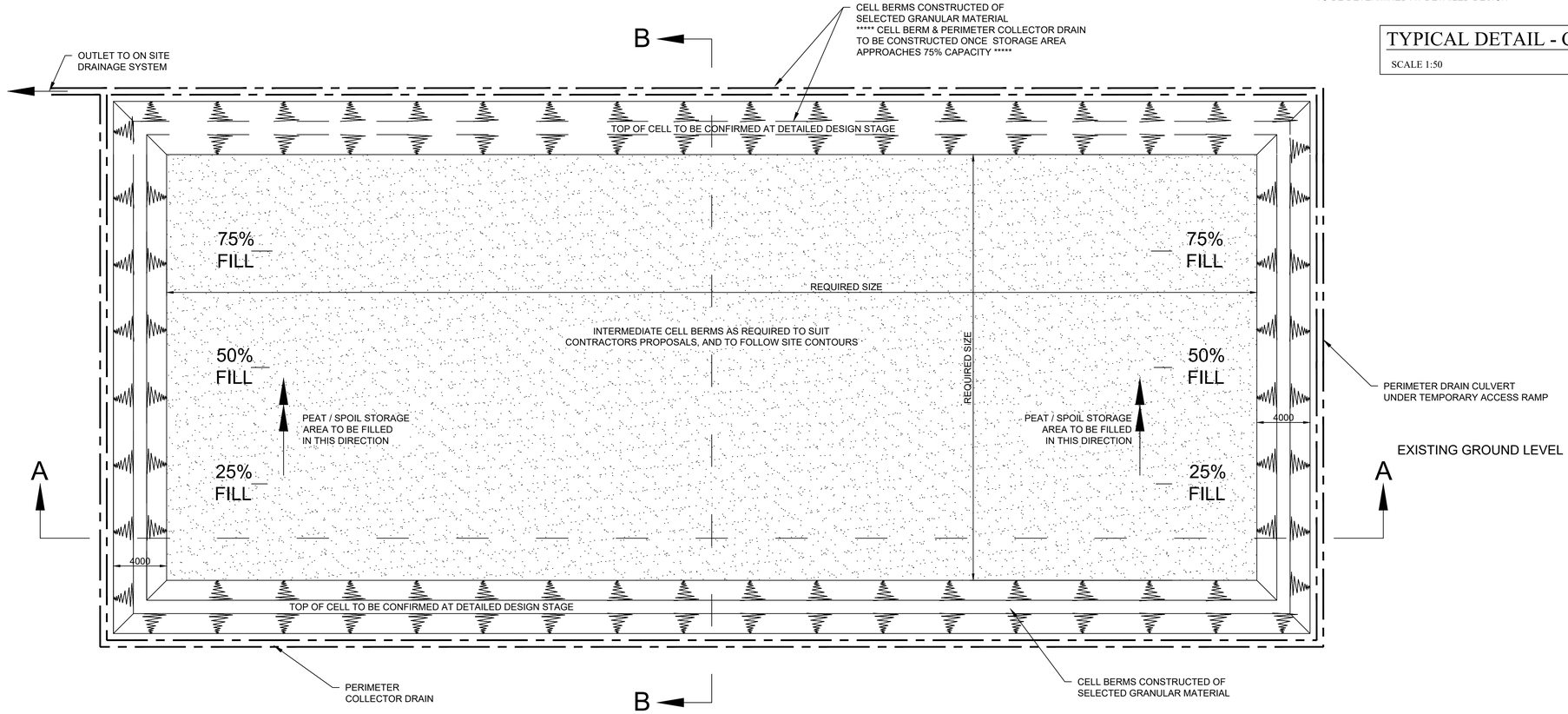
PEAT / SPOIL STORAGE - TYPICAL SECTION B-B

SCALE 1:200



TYPICAL DETAIL - CELL BERM

SCALE 1:50



PEAT / SPOIL STORAGE - TYPICAL PLAN

SCALE 1:200

NOTES:

1. THIS DRAWING IS FOR PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT PURPOSES AND SHOULD NOT BE USED AS DETAILED DESIGN OR FOR CONSTRUCTION.
2. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL PLACED MATERIAL WILL BE ALLOWED TO REVEGETATE NATURALLY FROM THE EXTENSIVE SEED SOURCE OF THE PLANTS THAT HAVE ALREADY COLONISED IN THE AREA. ALTERNATIVELY AND POSSIBLY IN ADDITION, SEEDING OF THE PLACED SPOIL COULD BE CARRIED OUT WHICH WOULD AID IN STABILISING THE PLACED SPOIL IN THE LONG TERM.
5. WHERE POSSIBLE, THE ACROTELM SHALL BE STORED WITH THE VEGETATION PART OF THE SOD FACING THE RIGHT WAY UP TO ENCOURAGE GROWTH OF PLANTS AND VEGETATION AT THE SURFACE OF THE STORED PEAT WITHIN THE PEAT STORAGE AREAS.
6. BOG MATS TO BE USED WHERE NECESSARY TO FACILITATE PLANT & MACHINERY ACCESS OVER SOFT GROUND.

REV:	S2-P01	DATE:	11/07/22	DRAWN BY:	EFC	CHECKED BY:	CE
DESCRIPTION:	ISSUED FOR INFORMATION						

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E info@gdgeo.com
www.gdgeo.com

ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

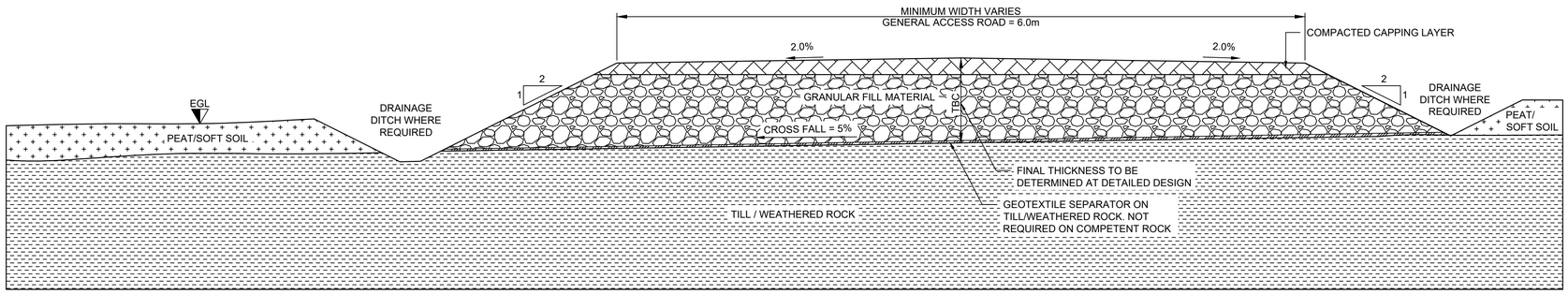
DRAWING No: 20021-GDG-ZZ-XX-DR-C-2000

Revision: -S2-P01

DRAWING TITLE: PEAT AND SPOIL STORAGE AREA TYPICAL DETAILS

SCALE:	SHOWN	SHEET SIZE:	A1	DATE:	11/07/2023
DRAWN BY:	EFC	CHECKED BY:	C.E.	APPROVED BY:	J.O'D

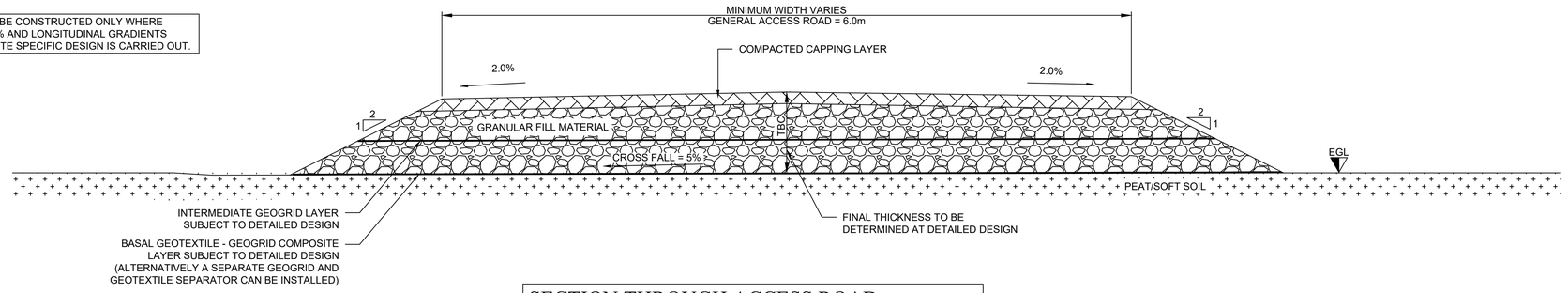
Appendix C ROAD CONSTRUCTION DETAILS



SECTION THROUGH ACCESS ROAD NEW CONSTRUCTION: FOUNDED - DETAIL 01

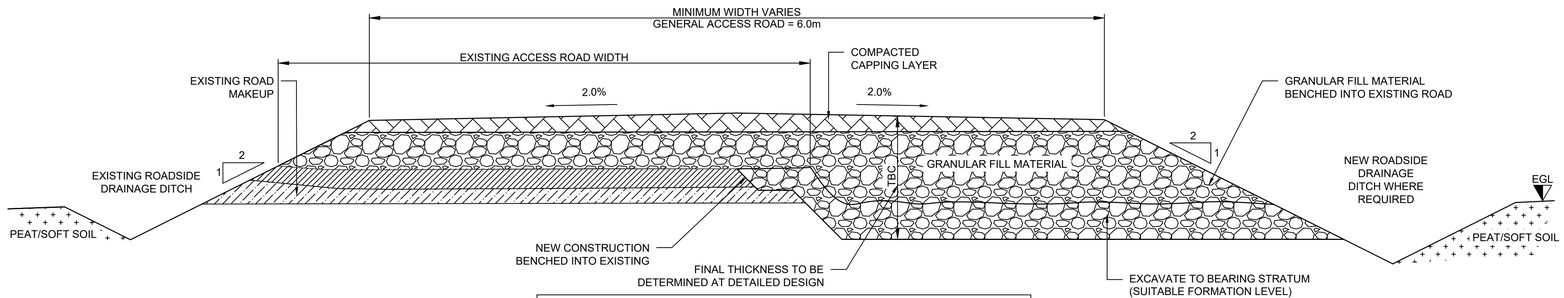
SCALE: N.T.S.

FLOATING ROADS TO BE CONSTRUCTED ONLY WHERE CROSSFALLS ARE <5% AND LONGITUDINAL GRADIENTS ARE <5% UNLESS A SITE SPECIFIC DESIGN IS CARRIED OUT.



SECTION THROUGH ACCESS ROAD NEW CONSTRUCTION: FLOATED - DETAIL 02

SCALE: N.T.S.



SECTION THROUGH WIDENING OF EXISTING ACCESS ROAD: FOUNDED - DETAIL 03

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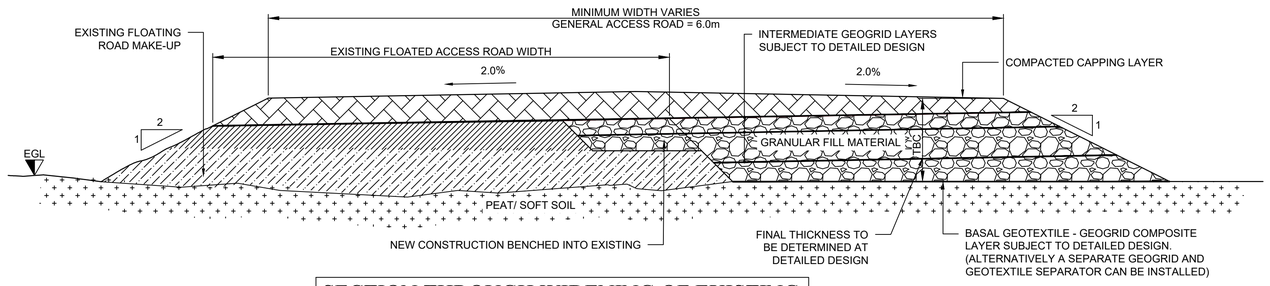

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ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

DRAWING No: 20021-GDG-ZZ-XX-DR-C-0100

Revision: -S2-P01

DRAWING TITLE: ACCESS ROAD STANDARD DETAILS

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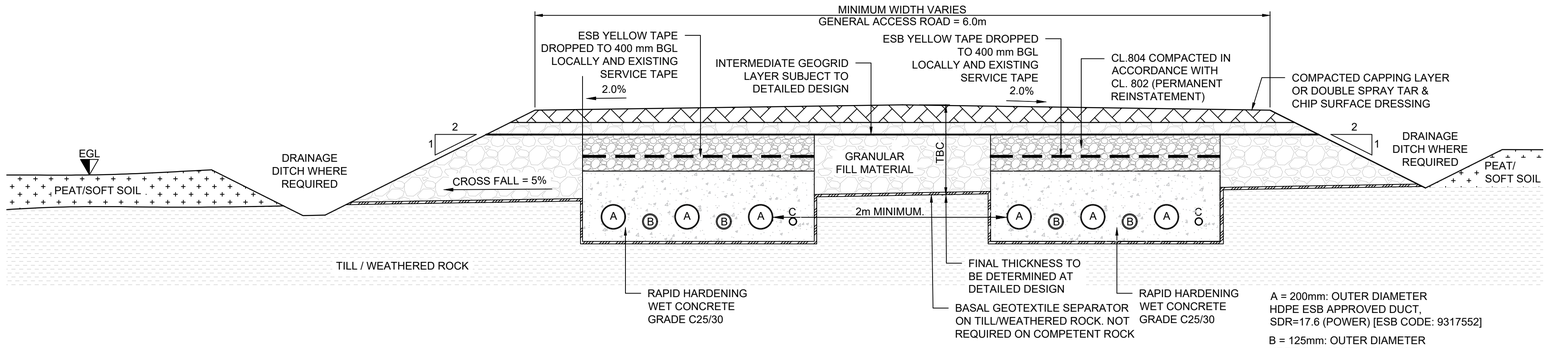
Appendix D CABLE TRENCH DETAILS



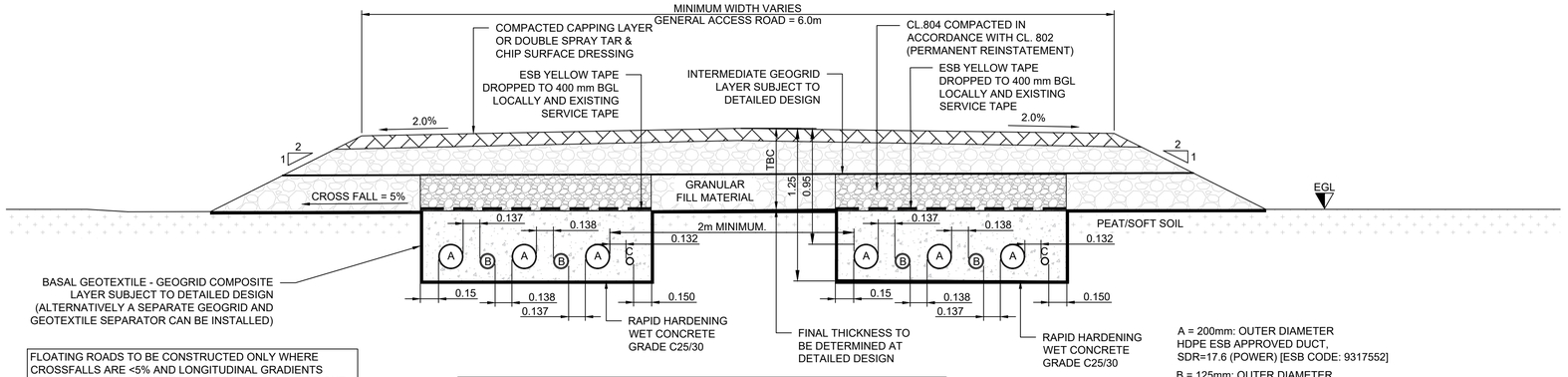
A = 200mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (POWER) [ESB CODE: 9317552]

B = 125mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (COMMS) [ESB CODE: 9317552]

C = 63mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (ECC) [ESB CODE: 9317552]

SECTION THROUGH CABLE TRENCH
NEW CONSTRUCTION: FOUNDED - DETAIL 01

SCALE: N.T.S.



FLOATING ROADS TO BE CONSTRUCTED ONLY WHERE CROSSFALLS ARE <5% AND LONGITUDINAL GRADIENTS ARE <5% UNLESS A SITE SPECIFIC DESIGN IS CARRIED OUT.

A = 200mm: OUTER DIAMETER
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HDPE ESB APPROVED DUCT,
SDR=17.6 (COMMS) [ESB CODE: 9317552]

C = 63mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (ECC) [ESB CODE: 9317552]

SECTION THROUGH CABLE TRENCH
NEW CONSTRUCTION: FLOATED - DETAIL 02

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4. DRAINAGE TO BE PROVIDED TO PREVENT WATER DEGRADATION OF THE SUBFORMATION SOILS IN-LINE WITH DRAINAGE STRATEGY.
5. BURIED CABLE SPACING TO BE DETERMINED DURING DETAILED DESIGN
6. DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED

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CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

DRAWING No: 20021-GDG-ZZ-XX-DR-C-0101

Revision: -S2-P02

DRAWING TITLE: CABLE TRENCH STANDARD DETAILS

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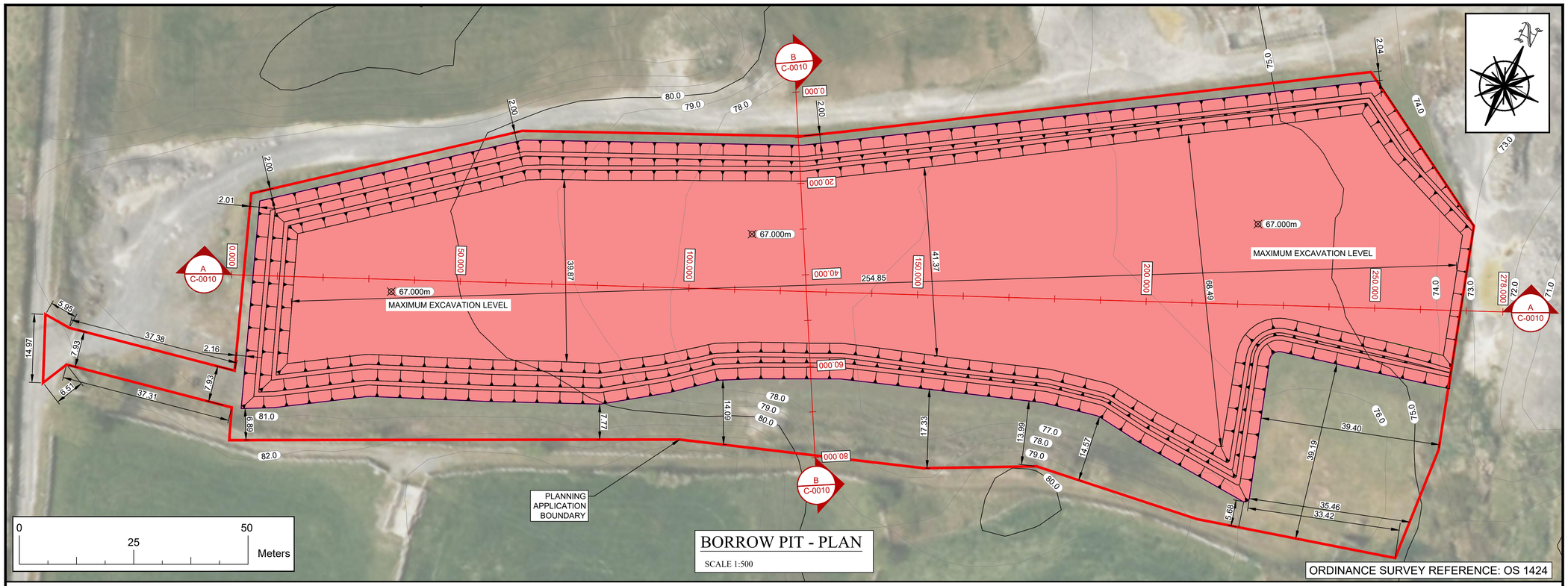
DRAWN BY:	EFC	CHECKED BY:	C.E.	APPROVED BY:	J.O'D.

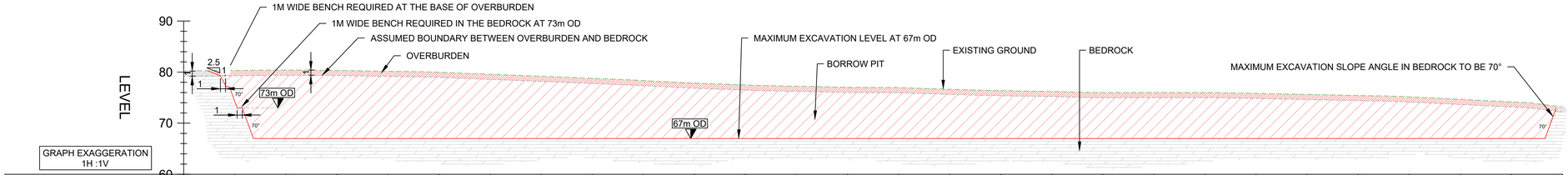
Appendix E BORROW PIT DETAILS



BORROW PIT - PLAN

SCALE 1:500

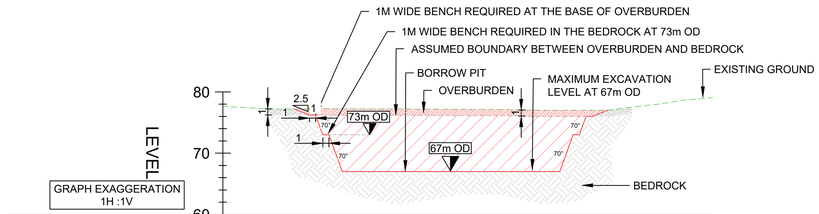
ORDINANCE SURVEY REFERENCE: OS 1424



CHAINAGE (m)	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000	220.000	230.000	240.000	250.000	260.000	270.000
EXISTING LEVELS (mOD)	80.233	80.329	80.395	80.324	80.177	79.978	79.577	79.196	78.788	78.348	77.848	77.496	77.261	77.000	76.977	76.648	76.387	76.220	76.000	76.000	76.000	75.847	75.635	75.424	75.169	74.668	74.178	73.174

SECTION A-A

SCALE 1:500



CHAINAGE (m)	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000
EXISTING LEVELS (mOD)	77.687	77.181	77.243	77.196	77.149	77.019	77.000	77.882	79.076

SECTION B-B

SCALE 1:500

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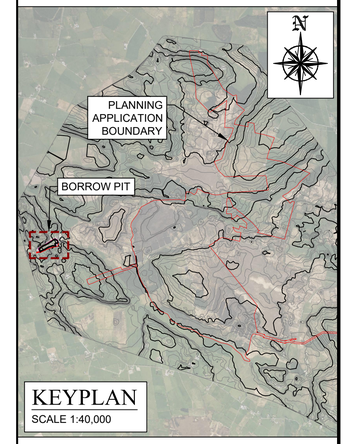
3. THE OUTLINE AND SECTIONS ARE INDICATIVE AND ARE SUBJECT TO DETAILED DESIGN, SLOPE STABILITY ASSESSMENT AND ADDITIONAL GROUND INVESTIGATION.
4. IN-SITU ROCK SLOPE SHALL BE FORMED AT STABLE INCLINATIONS TO SUIT LOCAL ROCK CONDITIONS AND SUBJECT TO DETAILED DESIGN.
5. THE EXCAVATABILITY OF THE ROCK AND DEPTH TO TOP OF ROCK WITHIN EACH OF THE BORROW AREAS WILL NEED TO BE DETERMINED FROM A GROUND INVESTIGATION.
6. BORROW PIT 3D MODEL BASED ON TOPOGRAPHICAL SURVEY: 1m CONTOURS, RECEIVED 02.10.2023.
7. BORROW PIT EXTENTS TAKEN FROM MKO SHAPE FILE BP 2023.09.21, RECEIVED 21.09.2023. BORROW PIT EXTENT HAS BEEN MODIFIED BY GDG TO REFLECT OFFSETS FROM EXISTING SLOPES.



KEYPLAN

SCALE 1:40,000

LEGEND:

- BEDROCK (IN-SITU)
- BEDROCK (EXCAVATED)
- OVERBURDEN (IN-SITU)
- OVERBURDEN (EXCAVATED)

REV:	DATE:	DRAWN BY:	CHECKED BY:
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DESCRIPTION:	OS NOTE ADDED		
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Revision: -S2-P02

DRAWING TITLE: BORROW PIT PLAN & SECTIONS

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DRAWN BY: K.H	CHECKED BY: A.A	APPROVED BY: J.O'D

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Peat and Spoil Management Plan for Clonberne Wind Farm

Client	**MKO**
Document Ref.	20021-R-02-PSMP-04
Project Title	Clonberne Wind Farm
Date	14/06/2024

Project Title:	Clonberne Wind Farm
Report Title:	Peat and Spoil Management Plan for Clonberne Wind Farm
Document Reference:	20021-R-02-PSMP-04

Client:	MKO
Ultimate Client:	Clonberne Wind Farm Ltd.
Confidentiality	Client Confidential

REVISION HISTORY

Rev	Date	Reason for Issue	Originator	Checker	Reviewer	Approver
00	27/07/2022	WIP Issue	Irene Pascual	Niall O'Brien	Laura Burke	Laura Burke
01	30/01/2024	Update to reflect final layout	Chris Engleman	Stephen Curtis	Paul Quigley	Paul Quigley
02	26/02/2024	Update to Address MKO comments	Chris Engleman	Stephen Curtis	John O'Donovan	John O'Donovan
03	09/04/2024	Update to Address final MKO comments	Chris Engleman	Stephen Curtis	John O'Donovan	John O'Donovan
04	14/06/2024	Update to revise Borrow Pit Spoil Management details.	Chris Engleman	Stephen Curtis	Stephen Curtis	Paul Quigley

DISCLAIMER

REVISION SUMMARY

Rev	Date	Section(s)	Detail of Change
01	30/01/2024	All	Revision to account for updated layout.
02	26/02/2024	All	Revision to address MKO comments
03	09/04/2024	All	Revision to address final MKO comments
04	14/06/2024	7, 8	Update to revise Borrow Pit Spoil Management details.

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EXECUTIVE SUMMARY

MKO commissioned Gavin and Doherty Geosolutions Limited (GDG) to undertake a Peat Management Plan (PSMP) for the proposed Clonberne Wind Farm. Following planning guidelines compiled by the Department of the Environment, Heritage and Local Government (DoEHLG), where peat is present on a proposed wind farm development, a peat management plan is required. The proposed Clonberne Wind Farm consists of 11 turbines, one 220kV substation and associated grid connection, two construction compounds, access tracks and associated additional infrastructure.

This report provides details on the approximate predicted volumes of peat to be excavated during construction, the characteristics and types of peat to be excavated, construction methodologies to reduce the volumes of peat to be excavated, and the guidelines for how and where this excavated peat will be placed, reused and managed. This peat management plan will be further developed and implemented after the Proposed Project receives consent. Further details and specific plans will be determined during the detailed design phase and once further confirmatory site investigations have been undertaken. These details will then be included in a detailed Peat and Spoil Management Plan as part of the detailed Construction Environment Management Plan (CEMP). The responsibility for implementing the PSMP will lie with the Principal Contractor. The peat thickness encountered by intrusive investigations across the site varies from negligible to a maximum of 6.65m, with an average of 1.68m recorded. Most of the site contains little to no peat, with T1-T4 and T9 located in areas of no peat and will be underlain by cohesive or granular glacial tills. Much of the remaining proposed infrastructure, including T5-T7, T10-T11, and the construction compounds, are located in areas of cut-over peat, where turbary peat harvesting has removed significant quantities of peat, reducing peat thicknesses. T08 is located in forestry, planted over peat of up to 2.16m thick. In total, 69.9% of recorded peat thicknesses were under 1m, and 85.6% were under 2m.

The existing access tracks will need to be upgraded, and new access roads will need to be constructed. The preliminary outline of road construction types, construction methodologies, and methods for constructing turbine bases, hardstandings, and other infrastructure foundations have been defined. Piled foundations will be used as an alternative to gravity base foundations where the ground conditions require it. Gravity foundations will be utilised at T1-T4 with precast piles the only alternative being considered at these locations. Of the proposed new access tracks, 7.6km are proposed to be of founded construction, while 2.4km is proposed for floated construction.

Preliminary volumes for the peat generated during construction are presented in this document, along with guidelines for handling and storing excavated peat and recommendations for good construction practices. It is calculated that the total peat excavation volume will be 49,370m^3, while the total spoil excavation volume will be 39,350m^3. It is assessed that the total capacity for placement and reinstatement of peat is 55,480m^3, and 42,400m^3 for spoil, leading to an overall balance of 6,110 m^3 of additional contingency capacity for peat, and 3,050 m^3 for spoil.

The peat management assessment findings indicate that all the peat material excavated can be placed safely on-site during construction.

1 INTRODUCTION

MKO requested Gavin and Doherty Geosolutions Ltd. (GDG) to prepare a Peat Management Plan (PSMP) on behalf of Clonberne Wind Farm Ltd. as part of an application for planning permission for the Proposed Clonbenre Wind Farm, Co. Galway, hereafter referred to as 'The Proposed Project Project'. The Proposed Project and peat depth plan are presented in Appendix A.

1.1 STATEMENT OF AUTHORITY

GDG is a specialist geotechnical and marine civil design consultancy that provides innovative engineering solutions to a broad infrastructure problem. Established in 2010, GDG has since grown to more than 180 people. We aim to deliver an innovative, cost-effective, and reliable service tailored to meet and exceed our clients' requirements. We strive to attain the highest possible standards and consistently seek to pioneer and develop new technologies and techniques while ensuring that all relevant design codes and practices are met.

GDG brings together state-of-the-art research and direct industry experience and offers a bespoke engineering service, delivering the most progressive, reliable, and efficient designs across various projects and technical areas, including forensic engineering and expert witness services to the Insurance and Legal sectors. Our clients include large civil engineering contractors, renewable energy developers, semi-state bodies, and engineering and environmental consulting firms.

GDG has been involved in many wind farm developments in both Ireland and the UK at various stages of development, i.e. preliminary feasibility, planning, peat stability assessment, design, and construction. The GDG team, made up of engineering geologists, geomorphologists, geotechnical engineers, and environmental scientists, has developed expertise in the design and construction of developments in peat areas.

The members of the GDG team involved in this assessment include:

- **Paul Quigley – Project Director**. Paul is a Chartered Engineer with over 26 years of experience in geotechnical engineering and a UK Registered Engineering (RoGEP) Advisor. He has worked on a wide variety of projects for employers, contractors and third parties, gaining a range of experience, including earthworks for major infrastructure schemes in Ireland and overseas, roads, tunnelling projects, flood protection schemes, retaining wall and basement projects, ground investigations and forensic reviews of failures. Paul is adept at designing creative solutions for complex problems and has published numerous peer-reviewed technical papers. He has also acted as an independent expert for several legal disputes centred on ground-related issues. He is a reviewer for the ICE Geotechnical Engineering Journal, a member of the Eurocode 7 review panel at NSAI and a former Chairman of the Geotechnical Society of Ireland.
- **John O'Donovan**. John leads the onshore renewable sector at GDG. He completed his PhD at Imperial College, investigating the use of DEM to model wave propagation techniques to measure small-strain soil stiffness. After completing the PhD, John spent 2.5 years working with BH's Ground Engineering Group. He has over ten years of experience in engineering and seven years in his current role. At GDG, John manages onshore wind farm projects and solar farm projects. John specialises in dealing with difficult ground conditions and providing robust designs for projects in peatland areas. John also works on the landfall and onshore aspects of offshore windfarms, including cable routing and onshore substation foundation design.

- **Stephen Curtis**. Stephen is a Senior Engineering Geologist on the onshore renewables team. He has over seven years of experience in both site investigation contracting and geotechnical consultancy environments. He is Chartered with the Institute of Geologists of Ireland (IGI) and the European Association of Geographers. Stephen has worked on multiple renewable energy projects, primarily solar and wind farm projects in Ireland and the UK, for over four years. He has been involved in the feasibility study, planning, design and construction stages of wind and solar farm developments, focusing on geotechnical risk management and mitigation for construction in upland peat areas and Irish glacial ground conditions.
- **Chris Engleman**. Chris is a Geologist with a Master's degree in Geological Sciences from the University of Leeds. He has four years of industry experience within the onshore renewables sector and the field of geological mapping with a particular focus on Quaternary geology, predominantly working on projects for peat stability and management, ground investigation, rock and soil logging, GIS mapping and geotechnical design. Chris has worked on several renewable energy projects, particularly wind and solar, for over two years. Chris supervised site investigation works at the Proposed Project in 2023.
- **Brian McCarthy**. Brian is a Civil Engineer within the infrastructure team in GDG with two years of post-graduate experience. Brian holds a Master's degree in Civil, Structural and Environmental Engineering from University College Cork and is a member of the Institution of Engineers of Ireland. Brian has worked on various renewable energy and infrastructural projects in Ireland and the UK and has carried out peat probing on several projects throughout Ireland. Brian lead peat probing site investigation works at the Proposed Project in 2023.
- **Efstathia Chioti**. Efstathia is a Geotechnical Engineer within the structures team in GDG with 2 years of industry experience. Since joining GDG, Efstathia has completed geotechnical design work on various projects, including retaining wall design, shallow foundation design and earthworks, and ground movement assessment in Ireland and the UK. She has strong technical skills within geotechnical design. Efstathia lead peat probing site investigation works at the Proposed Project in 2023.
- **Daniel Murphy.** Daniel is a Graduate Engineer working in both the GDG Infrastructure team and the Structures team. He has a Masters' degree in Civil Structural and Environmental Engineering from University College Cork and has been working with GDG since graduating in 2022. Daniel has worked on a variety of Temporary Works and Permanent Works design projects in Ireland and the UK. Daniel has carried out site inspections, visual assessments of slopes, peat probing and water sampling on a number of projects throughout Ireland. Daniel carried out peat probing at the Proposed Project in 2023.

1.2 GUIDANCE DOCUMENTS

This PSMP has been prepared with consideration of industry best practices relating to wind farm construction and peatlands. This best practices include:

- Wind Energy Development Guidelines. Department of Housing, Planning and Local Government (2006);
- Draft Revised Wind Energy Development Guidelines. Department of Housing, Planning and Local Government (2019);

- Good practice during wind farm construction. A joint publication by Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland (2015);
- Scottish Government, Guidance on Developments on Peatland – Site Surveys (2017);
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste, Scottish Renewables and SEPA (2012); and
- Floating Roads on Peat, Scottish Natural Heritage (2011).

Many of the publications listed above have been developed by the Scottish Regulators and are considered best practice in Ireland and are therefore appropriate for reference within this PSMP.

This PSMP and compliance with it shall not relieve the developer of its obligations to undertake detailed ground investigations or geotechnical design before construction or any obligations relating to other aspects of the environment.

1.3 PROPOSED PROJECT

The Proposed Project is located approximately 14km northeast of Tuam and approximately 6.5km southeast of Dunmore in Co. Galway. The approximate location of the centre of the site is X554464, Y756549 in Irish Transverse Mercator (ITM). The proposed site covers approximately 353 hectares (Appendix A, Figure A-1-1).

The Proposed Project Description is detailed in Chapter 4 of the Environmental Impact Assessment Report (EIAR), which includes the works subject to a proposed planning application for An Bord Pleanála about the Proposed Wind Farm Site.

The Proposed Wind Farm Site will comprise the elements listed below:

1. 11 No. wind turbines and associated hardstand areas;
    a. Tip Height of 180m
    b. Rotor Diameter of 162m
    c. Hub Height of 99m
2. A 35 year operational life from the date of full commissioning of the wind farm and subsequent decommissioning;
3. Upgrade of existing tracks/ roads and provision of new site access roads, junctions, and hardstand areas;
4. All works associated with the provision of a new permanent site entrance off the R328 Regional Road in the townland of Killavoher;
5. 2 no. Temporary construction compounds;
6. 1 no. Borrow pit;
7. Peat, Spoil and Overburden Management Areas;
8. 1 no. permanent 220kV electrical substation which will be constructed in the townland of Cloonarkan. The proposed electrical substation consists of a two-storey control building with welfare facilities, all associated electrical plant and equipment, battery storage system, security fencing, all associated underground cabling, wastewater holding tank and all ancillary works and equipment;
9. Underground electrical (33kV) and communications cabling from the proposed wind turbines to the proposed 220kV substation;

10. All works associated with the connection of the Proposed Project to the national electricity grid, via the provision of the underground electrical cabling (220kV) to the existing 220kV overhead line in the townland of Laughil;
11. The provision of 2 no. new interface towers replacing two existing angle masts to facilitate the connection to the existing overhead line;
12. Provision of 1 no. joint bays, communication chambers and earth sheath links along the underground electrical cabling route;
13. Reinstatement of the road or track surface above the proposed cabling trench along existing roads and tracks;
14. Junction Accommodation works to facilitate turbine delivery;
15. Site Drainage;
16. 1 no. Peatland Enhancement Area
17. Tree Felling;
18. Operational stage site signage; and
19. All associated site development works and apparatus

The Proposed Project has been designed with an operational life of 35 years, at the end of which it can be decommissioned. The Applicant is therefore seeking a ten-year permission and a 35-year operational life from the Proposed Project's commissioning date. Please refer to Chapter 4 of the EIAR for a detailed description of the development.

This report examines the conditions at the Proposed Project Site, located within the EIAR Site Boundary as defined in Chapter 1 of the EIAR, and does not analyse the transport delivery route. The transport delivery route has not been included in this report as no peat stability risk is expected along the route. Works on the transport delivery route are not expected to be carried out in peat material and will not require excavating or placing significant amounts of material. The '*Proposed Project Project'* or '*Site'* in this report refers to the core of the Proposed Project and grid connection route as defined in Chapter 4 of the EIAR.

1.4 SCOPE OF REPORT

This report contains the following:

- A summary of proposed construction activities on-site;
- A review of peat conditions on-site;
- Road construction types;
    - Methodologies for the construction of each type of access road and road construction details;
- Methodologies for the excavation of turbine bases, hardstands, substation and compounds,
- Summary of the area proposed for peatland enhancement,
- Summary of the on-site borrow pit location and typical detail drawings;
- Peat and spoil excavation and reinstatement volumes,
- Summary of peat and spoil repository areas and typical detail drawings;
- Guidelines for handling and storing excavated peat and spoil, and
- Recommendations for good construction practice.

1.5 Summary of Construction Activities

For the construction phase, the activities that are considered likely to generate peat are as follows:

1. The construction of new excavated roads. We note that floating road construction does not require peat excavation.
2. The upgrade and widening of existing founded access roads.
3. Excavations for cable trenches beneath new roads.
4. Excavations for turbine bases, hardstands, construction compounds and substation.

1.6 General Principles of Peat and Spoil Management

The general purpose of the PSMP is to outline the methodologies of peat excavation and reinstatement, outline the safety steps required for the safe placement and management of peat material, and minimise disruption to the peatland environment. The methods outlined in the report aim to:

- Reduce the exposure of bare or excavated peat material,
- Reduce the potential for release of sediment into watercourses or groundwater,
- Ensure that the Proposed Project does not adversely impact the landscape and environment,
- Ensure good site management practices are followed throughout the Proposed Project's construction, operation, and decommissioning phases.

Consideration needs to be given to the risks created by peat excavation, placement, and reinstatement, both temporary and permanent. These risks will be managed and mitigated through the methodologies outlined in this Peat and Spoil Management Plan document and the associated Peat Stability Risk Assessment Report (PSRA, EIAR Technical Appendix 8-1).

Placement or any reinstatement of excavated peat material will be carried out in a fashion which ties in with the existing natural topography and facilitates the reduction of the visual impact on the structures of the Proposed Project. This can be done by landscaping the placed peat with shallow slopes, promoting natural vegetation growth, and allowing for controlled drainage from all structures.

All reinstatement works will be carried out considering potential peat instability, having completed a diligent design and considering the findings of the associated Peat Stability Risk Assessment Report (GDG 20021-R-01-PSRA-01). Works will be carried out under the supervision of an appropriately experienced geotechnical engineer and the Project Ecologist.

2 PEAT CONDITIONS AND STABILITY

2.1 SITE CONDITIONS

An assessment of the ground conditions encountered during the ground investigations and reviewing the available existing mapping suggests that the Proposed Project site consists of a generally flat topography, with occasional ridges of glacial material (Drumlins) separating large, flat-lying raised peat bogs, which have been subject to heavy turbary peat harvesting. This activity has led to large expanses of flat-lying, cut-over shallow peat, where much of the planned infrastructure is located. According to the available GSI mapping (Figure 2-1) and GDG's site observations, Turbines T1-T4 and T9 are located on glacial material, while T5-T7, T10 and T11 are located in areas of open, cut-over raised bog. T8 is located on cut-over peat, which has been planted for forestry.

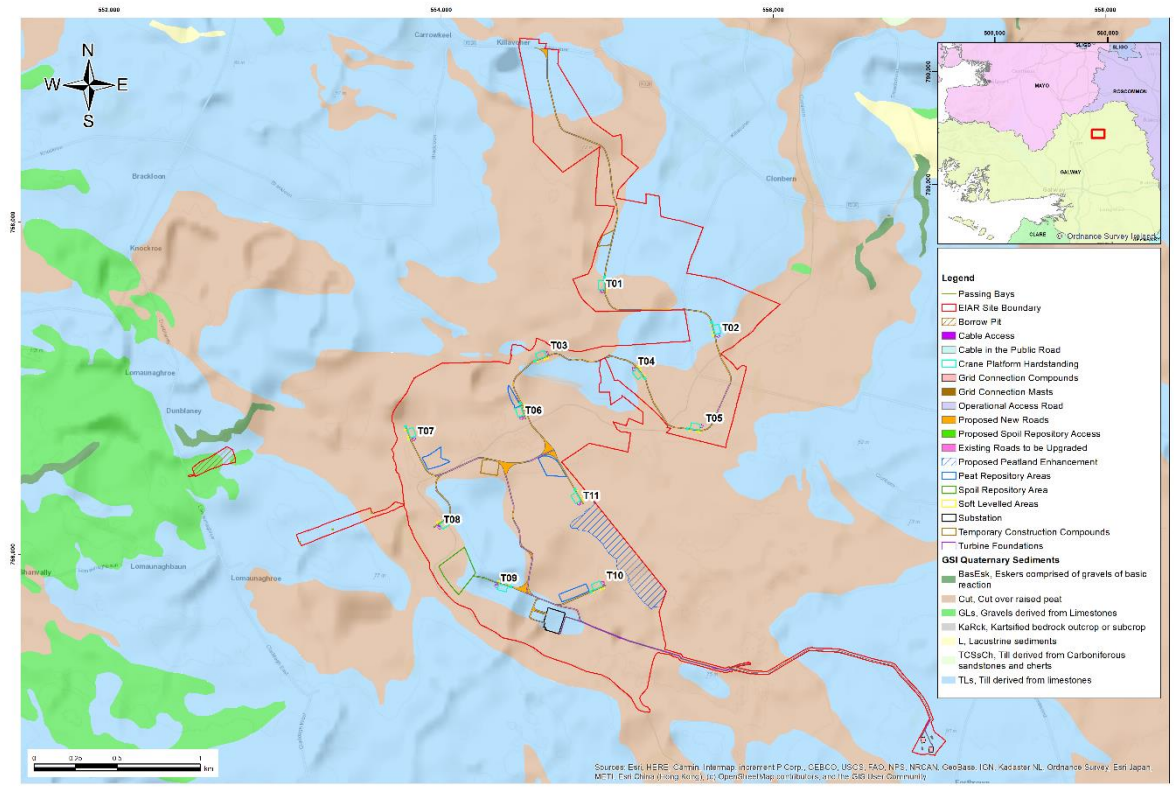


Figure 2-1: GSI Quaternary Sediments map, showing areas of cut-over peat and glacial till dominating the area.

2.2 PEAT CLASSIFICATION

The Scottish Government provides guidance as to the definition of peat in their Peat Survey Guidance document:

"*the Joint Nature Conservation Committee (JNCC) Report 445, Towards an Assessment of the State of UK Peatlands, definitions are used:*

- *Peaty (or organo-mineral) soil: a soil with a surface organic layer less than 0.5m deep;*
- *Peat: a soil with a surface organic layer greater than 0.5m deep which has an organic matter content of more than 60%;*

- *Deep peat: a peat soil with a surface organic layer greater than 1.0m deep*."

For this report, peat is considered with respect to the two principal types:

- Acrotelm: This upper layer comprises of poorly decomposed plant material and living vegetation. It is relatively dry with some tensile strength, providing limited structural properties. For peat classification in this report, the Acrotelm layer will be considered to be inclusive of 'peaty soil'.
- Catotelm: This lower layer is formed by highly decomposed humified peat decaying at a rate of several orders of magnitude slower than the acrotelm. As this catotelm layer grows, the slow peat formation represents an important sink for atmospheric CO^2. The amorphous structural of this layer is particularly vulnerable to excavation and disturbance as it tends to disintegrate completely on excavation. For the classification of peat in this report, the Catotelm layer will be considered to include 'peat' and 'deep peat' soils.

It is noted that data obtained through peat probing cannot be utilised in classifying the peat material, given that peat probing does not fully distinguish between the different types of peat material and between peat and other soft ground. It is considered that the sampling records from the intrusive investigation provide the most accurate representation of peat depths across the site. The trial pitting carried out in February 2020 allows peat conditions to be described in a small number of locations (Section 2.4). However, the peat probing data generally compares well with the other intrusive data, so all data types, peat probe, trial pit and hand shear vane locations, have been used in the peat thickness assessment.

The interpolated peat thickness plan for the Proposed Project is shown in Figure 2-2 and is shown in greater detail in Appendix A.1 Figure A-1 2 to Figure A-1-4.

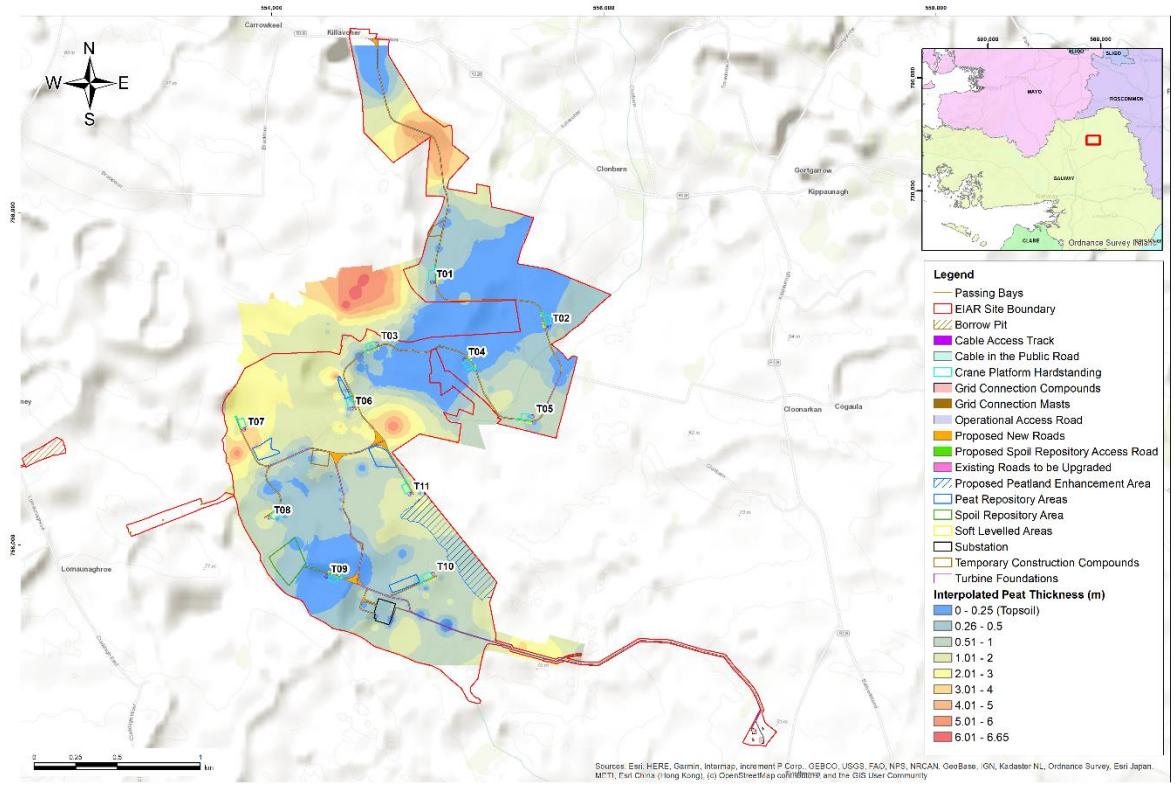


Figure 2-2: Interpolated peat depth plan of the main site area

2.3 GROUND INVESTIGATION AND ENCOUNTERED PEAT THICKNESS

GDG conducted a site reconnaissance as part of the assessment, comprising four walk-over inspections (February 2020, March 2020, May 2023, and September 2023) to record geomorphological features concerning the Proposed Project, peat depths, and peat strength. An indication of the site conditions (harvested peat, peat bogs, wetlands, and forestry) with flat topography is shown in Figure 2-3 and Figure 2-4. Access was limited to some areas, in particular, the area proposed for peatland enhancement in between T10 and T11, limiting the number of peat probes taken in this area.

Figure 2-3: Harvested peat close to T11.

Figure 2-4: Peat cuts 100m east of T10.

Seven ground investigations (GI) were carried out on the site:

1) MKO (May 2019): 21 peat probes
2) GDG (February 2020): 47 peat probes and 7 hand shear vanes.
3) GDG (February 2020): 15 trial pits.
4) GDG (March 2020): 47 peat probes.
5) MKO (May-June 2021): 5 open-hole well boreholes.
6) GDG (May 2023): 40 peat probes and 3 shear vanes.
7) GDG (September 2023): 39 peat probes and 4 shear vanes.

In summary, intrusive ground investigations were carried out at 229 locations. The findings of these GIs are summarised in the GDG Peat stability Risk Assessment (PSRA) report, Ref.:20021-PRSA-001-01 (EIAR Technical Appendix 8-1). The GI locations considered the following criteria:

- Spatial distribution of the proposed infrastructure;
- Distance between probe points to avoid interpolation of peat depths across large distances;
- Changes in slope angle, as peat depths are likely to be shallower on steeper slopes;
- Changes in vegetation, which can reflect changes in peat condition;
- Changes in hydrological conditions; and
- Changes in land use.

No evidence of any significant previous landslides was identified during the walkovers. Some possible instability indicators were identified in the southeast of the area proposed for peatland enhancement, which are described in more detail in the PSRA (EIAR Technical Appendix 8-1).

A raster map was created in GIS software presenting the interpolated peat depth across a site from the peat probe points using the Inverse Distance Weighted (IDW) method. This interpolated raster of peat depth is shown in Figure A-1 2 to Figure A-1-4 in Appendix A. The trial pit logs can be seen in Appendix A.4.

2.4 Ground Investigation Summary and Peat Conditions

The ground investigations indicate that the ground conditions at the site comprise predominantly areas of cut-over raised peat of up to 6.65m in depth, with patches of glacial till in the north, centre, and south of the site. Trial pit locations (Appendix A.4) suggest that the peat is typically underlain by granular or cohesive glacial material, with trial pits encountering stiff gravelly clays, gravelly sands, and sandy gravels beneath the peat or beneath topsoil in several locations.

Petersen Drilling Services Ltd. additionally carried out five open-hole boreholes for the purpose of the hydrological assessment (Chapter 9 of the EIAR). These boreholes encountered a similar mix of cohesive and granular glacial tills, and all encountered bedrock between 6m bgl and 16m bgl.

The peat thickness encountered by intrusive investigations across the site varies from 0m to a maximum of 6.65m, with an average of 1.68m recorded. Most of the site contains little to no peat, with T1-T4 and T9 being located in areas of no peat, underlain by cohesive or granular glacial tills. Much of the remaining proposed infrastructure, including T5-T7, T10-T11, and the construction compounds, are located in areas of cut-over peat, where turbary peat harvesting has removed

significant quantities of peat, reducing peat thicknesses. T08 is located in forestry, planted over peat of up to 2.16m thick.

The frequency of different peat thicknesses is shown in Figure 2-5. In total, 69.9% of recorded peat thicknesses were under 1m, and 85.6% were under 2m. Peat probe locations specifically targeted areas of identified peat; therefore, the density of probes in areas of peat thicknesses greater than 0.5 is higher than in areas of peat thicknesses less than 0.5m.

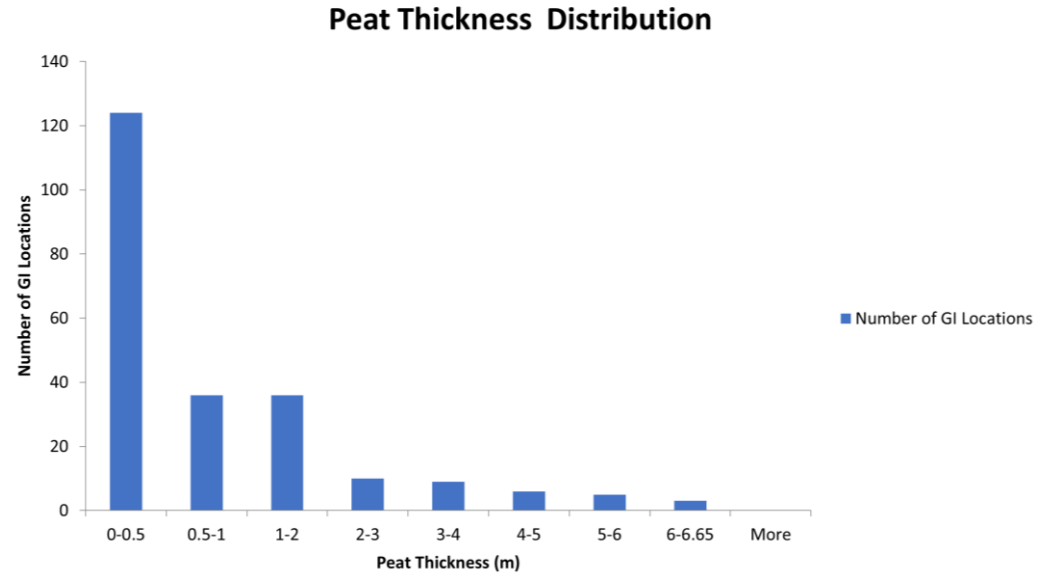


Figure 2-5: Histogram of peat thickness results across the site.

Laterally, extensive regions of >2m in depth were encountered in high-rise bog settings, particularly to the east of T07, south of T11, northeast of T10, west of T6, and between T01 and T3. These areas of deep peat are restricted to discrete raised bogs, which all major infrastructure postioning has avoided. The depths encountered are considered moderate to deep in places, with probes identifying peat thicknesses of up to 6.65m.

The walkover indicated that the peat was being cut in several areas and had drained significantly, with the observed peat classified as the catotelm. The surface condition of the peat is varied, with some areas having bare peat at the surface where cutting is active, as shown in Figure 2-3 and Figure 2-4, and some areas of un-cut peat capped by heather, with visible acrotelm. A large variation in the level of decomposition and humification was observed throughout the peat body. However, this generally appeared to increase with depth. Most of the peat material identified at the site during the trial pitting (Appendix A.4) is logged as fibrous and pseudo-fibrous, indicating that it is largely acrotelmic and will be suitable for landscaping and reinstatement adjacent to proposed infrastructure locations. Trial pits were not carried out in areas of >2m peat thickness, so there are likely to be areas of catotelmic peat which have not been logged. Hand shear vanes were carried out in 14 locations across the site, with results ranging from 18 to 70kPa.

2.4.1 Classification of Non-Peat Spoil

As noted in Section 2.4, subsoils across the site typically consist of granular or cohesive glacial material, with trial pits encountering stiff gravelly clays, gravelly sands, and sandy gravels. The stiff gravelly clays are interpreted as cohesive glacial tills, and the sands and gravels are interpreted as granular glacial tills or glaciofluvial deposits. A small percentage of the cohesive glacial till may be used to construct safety berms across the site. However, it is not considered that this material will

be suitable for use as engineering fill material, and so it will be considered as spoil. Some of the granular glacial till/glaciofluvial material may be suitable for reuse, pending further ground investigation and classification lab testing. The estimated volume of spoil material generated by construction at the Proposed Project is outlined in Section 8.

2.5 PEAT STABILITY RISK ASSESSMENT

A Peat Stability Risk Assessment has been undertaken for the site (EIAR Technical Appendix 8-1). Without the Proposed Project on-site, i.e. no additional loading on the peat slopes, the site is considered to be stable. Modelling has shown localised zones within the EIAR Site Boundary that become less stable with a 10kPa surcharge, akin to a 1m peat thickness on top of existing ground.

Areas of restricted stockpiling and construction have been identified as part of the PSRA (EIAR Technical Appendix 8-1) and are presented in Figure A-2-1 to Figure A-2-3 in Appendix A.2.

The restriction areas consist of:

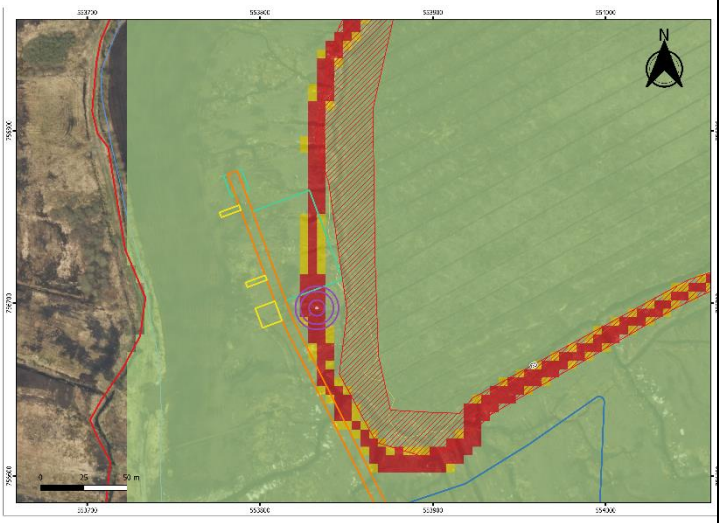
- Safety buffer areas – areas which **will be restricted for construction.** No development or construction activities will be carried out in these areas, including plant movements, peat or overburden excavation or reinstatement or placement of peat or any overburden materials.
- Peat stockpile restriction areas are **not restricted for construction but shall not be used for stockpiling of peat/side casting or overburden materials**. The Proposed Project footprint may occur within these areas, but peat placement and reinstatement are not permitted within these buffers. Any material excavated from within the peat restriction areas must be removed immediately and safely reinstated with a designated area elsewhere.

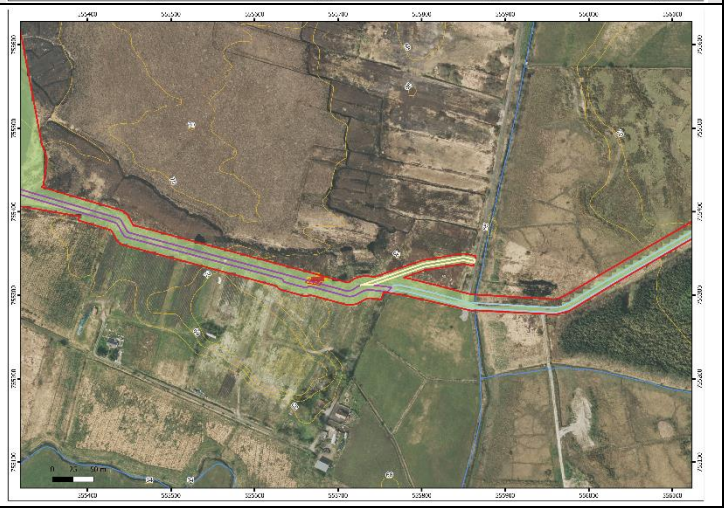
As outlined in the PSRA (EIAR Technical Appendix 8-1), the development of the safety buffer areas is a semi-automated approach which combines the developed polygon areas of the Scottish Executive (2017) factor of safety (FoS) results, areas of risk identified during the site walkovers and potential risk areas identified from the examination of peat depths and site topography. Safety Buffer Areas are outlined in Appendix A.2. Areas included in the safety buffer areas include an area of thick, raised peat to the east of T7.

Peat stockpile restriction areas are locations where the Proposed Project site layout encounters an area where a stability risk has been encountered with the addition of a 1m surcharge only and is otherwise considered stable in its natural state. The risk at these locations can be examined by looking at the geometry of the local slope and the proposed construction methodology, and the hazards will be mitigated with restricted peat and spoil placement and limiting plant operations within the area.

The stockpile restriction areas are outlined in Appendix A.2 Figure A-2-1 to Figure A-2-3, and some of the locations where key infrastructure encounter safety buffer zones are outlined in Table 2-1.

Table 2-1: Safety buffer zones at key locations.

Risk and mitigation	Undrained surcharged FoS analysis
The area at the hardstand and foundation for T7 suggests a FoS of <1 with the application of a 10kPa surcharge. Based on site observations and a study of aerial imagery, it is determined that this region of calculated low FoS is caused by locally deep peat and a steep slope at an existing peat cut face. A study of temporal aerial imagery (PSRA, EIAR Technical Appendix 8-1) indicates that the peat cut face has migrated east due to continued cutting activities since the capturing of both the topo data and the deepest peat probes at this location. This would indicate that the locally steep slope and deep peat have also migrated eastwards. Due to this information, the safety buffer zone in this location has been manually shifted to the east to follow the newly interpreted edge of the peat mass. It is, therefore, interpreted that the low FoS is not representative of current on-site conditions and does not represent a true hazard at this location. It is also noted that this turbine foundation is proposed to be piled, which will further limit any possible risk stability at this location. Further mitigation measures at the existing peat cutting include the stabilising of the cutting with excavated material and reinstatement to a natural gradient. Ensuring adequate Drainage and avoidance of drying out the peat, will also improve stability at this location.	

Risk and mitigation	Undrained surcharged FoS analysis
A small section of road interacts with an area of FoS <1.3 in the undrained scenario with 10kPa surcharge. This calculated low factor of safety is assessed to arise from locally deep peat and high slope angles at relict existing peat banks. It is determined that these do not present a global risk of peat failure, but that the ground must be levelled and stabilised locally prior to construction.	
A small area identified has a FoS <1. in the undrained scenario with a 10kPa surcharge interacts with a small section of the cable route. This low factor of safety is assessed to arise from locally deep peat and high slope angles calculated at relict existing peat banks. It is determined that these do not present a global landslide risk. The ground must be levelled and stabilised locally before construction, and peat will not be placed adjacent to the road in this area.	

3 HANDLING AND PLACING EXCAVATED PEAT AND SPOIL

Inappropriate placement of excavated peat and overburden and uncontrolled loading of peat material are considered among the main causes of peat instability and landslide event triggers during the wind farm construction process. The management and control of these activities is key to de-risking peat stability at the windfarm site.

The following outlines guidelines for the careful handling and placement of peat at the Proposed Project site:

1. Care shall be taken during peat excavation to ensure it is segregated from other soil types. Therefore, particular care will be taken to review recorded peat depths.
2. Peat shall be separated and placed by type, namely the acrotelmic and catotelmic layers.
    - Acrotelm (interpreted as the upper 0.5m of peat) is generally required for landscaping and shall be stripped and temporarily placed for reuse as required. Acrotelm stripping shall be undertaken before the main excavations.
    - Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage the growth of plants and vegetation.
    - All catotelm peat (peat below about 0.5m depth) shall be transported immediately on excavation to the designated peat repository areas,
    - The careful handling and segregation of peat types will help to optimise the reuse of peat, aiding in the retention of structure and integrity of the excavated peat material.
3. Peat and spoil shall be separated and stored separately in designated peat and spoil repository areas. It is not proposed to place peat in the borrow pit.
4. Depending on what vegetation is found on site, more fibrous material may be placed at steeper angles. Unconsolidated peat, generally comprising of catotelmic material, is often not suitable for general dressing, and any unconsolidated peat excavated must only be used for reinstatement where such reuse poses no risk of polluting water courses and evidence can be provided that the required water table at the chosen location can be maintained. However, from a review of the ground investigation logs, which identify predominantly fibrous and pseudo-fibrous material, it is considered that the material excavated will be generally suitable to facilitate:
    - Placement in designated Peat Repository Areas
    - Placement in restricted thicknesses on track shoulders and around infrastructure locations where topography permits.
5. Construction sequence planning shall minimise the time that peat is placed before reuse; however, some temporary peat placement will be required for spoil management and separation of spoil horizons before it can be placed in its reinstatement location. The principles on which the temporary placement of excavated peat will be based upon the general and particular placement and handling methodologies set out within this section. Temporary placement will be safe as it protects the structure and integrity of the excavated peat subject to prevailing local conditions. Temporary placement of peat must not be carried out in:
    - any area outlined as a peat stockpile restriction or safety buffer area in Section 2.5.
    - Areas possessing a slope angle of greater than 5°,

- Areas within 50m of a watercourse.

6. Reinstatement of peat and peat turves will be completed during the Construction Phase at the earliest practicable opportunity to avoid prolonged placement.
7. Any temporary placement locations will be in suitably wet conditions or be irrigated to prevent the peat from desiccating and precautions will be taken to ensure that turves are not allowed to dry out before reinstatement. The condition of turves will be monitored throughout the duration of placement. Irrigation of peat turves will be agreed in advance with the Ecological Clerk of Works (ECoW). Should wetting of turves be required to prevent desiccation, mitigation will be adopted to prevent run-off or discharge to any adjacent watercourses.
8. Sequencing of construction activities will be timed to allow peat placement in at least one peat repository area during all phases of construction. It may be necessary to utilise existing roads before the upgrade to allow the placement of peat in the initial phases of construction.
9. Plant movements and haul distances related to earthworks activity and peat excavation will be kept to a minimum.
10. Peat and spoil repositories cannot substantially erode or become dry.
11. Any material stockpiles or repository locations will be located at least 50m away from watercourses, including site ditches/sheughs, to reduce the potential for sediment to be transferred into the wider hydrological system.
12. Where possible, excavation will be timed to avoid very wet weather, periods of extreme rainfall and/or extended periods of prolonged rainfall.
13. Peat and spoil repository locations have been selected to limit re-handling as far as reasonably possible.
14. Excavated peat will be placed as close as possible to the immediate area of excavation.
15. The Contractor will consult the ECoW to agree on locations for material stockpiles and to avoid potential impacts on sensitive ecological receptors.
16. The Contractor will consult the site Geotechnical Engineer and review and take into account the PSRA (EIAR Technical Appendix 8-1) to avoid the risk of peat instability in peat excavations, peat stockpiling and all material stockpiling in areas underlain by peat.
17. Runoff from repositories shall be directed through the site drainage system, including silt fences, settlement ponds and other drainage measures as appropriate. These details will be outlined in the Contractor's Construction and Environmental Management Plan.

The following particular recommendations/best practice guidelines for the placement of peat and spoil with respect to specific aspects of the Proposed Project site will be considered and taken into account during construction.

3.1 ACCESS ROADS, HARDSTANDS AND OTHER INFRASTRUCTURE:

1. Controlled quantities of peat and spoil shall be side-cast adjacent to access roads and other infrastructure only where it can be placed in a stable formation, i.e. where the topography and ground conditions allow.
2. Side cast peat material shall consist of the acrotelm (upper layer) only and be landscaped and shaped to aid in reinstating the construction into the surrounding environment.

3. Cohesive spoil may be used to construct safety berms alongside access roads to heights of no greater than 1m and slopes not exceeding 1(V):2(H), unless a site-specific assessment during detailed design indicates a greater height and angle is safe.
4. Peat shall only be cast to safe heights and slope angles, considering the topography and the ground conditions. This height shall be no more than 1m, and the slopes shall be not greater than 1 (V): 3 or 4 (H) unless a site-specific assessment during detailed design indicates a greater height and angle is safe.
5. The effect of drainage or water runoff shall be considered when placing peat or spoil adjacent to access roads. Peat and spoil material shall not interfere with drainage, risk blocking of drainage systems or runoff into drainage systems.

3.2 PEAT REPOSITORY AREAS:

1. Peat repository areas have been identified at locations where the topography (slope angle <5°), peat depth, resulting stability assessment (FoS of >1.3 for 1m peat surcharge) and other environmental constraints (including 50m buffer from all watercourses) have allowed. These areas are designated for the permanent placement of up to 1m of peat material.
2. A cell berm will be constructed similarly to the peat repository area detail outlined in Appendix B. This cell berm will help to prevent the flow of saturated peat material. The stone berm will be constructed with a sufficiently coarse granular material or rock to enable the drainage of the placed peat material and prevent any instabilities within the repository area.
3. The stone cell berm will require a geotextile separator. The stone cell berm will be constructed using low-ground pressure machinery working from bog mats where necessary. The founding stratum for each stone buttress will be inspected and approved by a competent geotechnical engineer.
4. The height of the cell berm constructed will be greater than the height of the placed peat & spoil to prevent any surface peat runoff. Berms up to 1.25m in height will be required, subject to detailed design.
5. The cell berm is subject to the detail designer's specification; however, some peat excavation or installation of a shear key may be required to prevent global instabilities within the stored material. The shear key will comprise an excavation below the existing ground level beneath the cell berm to provide resistance against lateral forces.
6. Where possible, the placed peat and spoil surface will be shaped to allow efficient runoff of surface water from the peat and spoil repository areas.
7. Silting ponds will be required at the repository area's lower side/outfall location.
8. Intermediate berms or buttresses of spoil material may be installed within the peat repository area to aid in the placement and stability of the peat material. These berms will be shaped to align with the contours of the repository area.
9. The Contractor shall make every reasonable effort to promote growth in the peat repository areas following the placement of peat and completion of construction stage activities. Upper acrotelm layers shall be placed on the surface the right way up to promote vegetation growth. This growth will aid in stabilising the placed peat material and help in preventing it from becoming saturated following heavy periods of rain.

3.3 SPOIL REPOSITORY AREAS:

1. Cohesive glacial tills considered unsuitable for reuse in the Proposed Project will require placement in a separate spoil repository area.
2. The spoil repository area has been identified in a location where the topography (slope angle <5°), peat depth, resulting stability assessment (Factor of Safety of >1.3 for 1m peat surcharge) and other environmental constraints (including 50m buffer from all watercourses) have allowed. This area is designated for permanently placing up to 1m of non-peat spoil material.
3. Side slopes of placed spoil material are to be no greater than 1(V):2(H).
4. Where possible, the surface of the placed spoil will be shaped to allow efficient surface water runoff from the peat placement areas.
5. Silting ponds may be required at the repository area's lower side/outfall location.
6. Intermediate berms or buttresses of granular material may be installed within the spoil repository area to aid in the placement and stability of the spoil material. These berms will be shaped to align with the contours of the repository area.

The Contractor shall make every reasonable effort to promote growth in the spoil repository areas following the placement of spoil and completion of construction stage activities.

4 ROAD CONSTRUCTION TYPES

Existing roads will need to be upgraded and new access roads will need to be constructed at the proposed Clonberne Wind Farm. The following factors are considered in the preliminary proposals for road construction types:

- Constructability;
- Serviceability requirements for construction and wind turbine delivery and maintenance vehicles;
- Peat depth;
- Horizontal longitudinal and cross-fall gradient of the roads;
- Minimisation of excavation arisings; and
- The requirement to minimise disruption to peat hydrology.

The above key principles are used to determine the road type and will be finalised with regard to the prevailing ground conditions encountered during the confirmatory site investigation stages.

Floating roads minimise the impact on the peat, particularly peat hydrology. As there is no excavation required, no peat arisings are generated. However, a founded-type access road is more suitable if the underlying peat has an insufficient bearing capacity or is due to topographic restrictions or stability concerns.

The preliminary road construction details proposed for the development are summarised below in Table 4-1. The details of the road construction types are included in Appendix C. The distribution of propsed road construction types are show in in Figure A-3-1 to Figure A-3- 3 in Appendix A.

Table 4-1: Road construction types

Construction method	Appendix B Detail reference	Construction type
Construction of new roads	A	Founded
	B	Floating
Upgrade of existing access roads	C	Founded
	D	Floated

The design criteria for the suitability of floated access roads used for the Proposed Project Site align with the Scottish Executives Best Practice guidelines document. Some sections of the proposed access track are considered suitable for floated construction when the following criteria are met:

- Maximum slope in any direction is less than 5%,
- Peat depths are greater than 1m,
- The resulting drained and undrained slope stability assessment factor of safety results are greater than 1.3, without and with a 10kPa surcharge.

The main restricting criteria for floating roads at the Proposed Project site are the peat depth and slope angle, as many of the deep areas of peat are in short spans of access roadways, which can cause difficulties in creating adequate transition zones between founded and floated roads.

It is proposed that most of the new roads (7.6km, 76%) will be a founded construction (Detail A in Appendix C) with some sections of floated road (Detail B in Appendix C) suggested where the gradient and stability analysis results will allow (2.4km, 24%). A methodology and details are

provided for upgrading the existing founded and floated access roads (Detail C and D in Appendix C), as the existing roads will be upgraded and widened at the site.

General construction methodologies are presented in the following sections. This methodology aims to minimise impacts on the stability of the peat. These proposed methodologies will be informed by detailed design following further site investigation. The methodology is not intended to cover all aspects of construction, such as drainage and environmental considerations. Inspection and monitoring plans for each method will be implemented during construction to monitor peat stability.

4.1 Construction Methodology for New Roads

The general methodology to construct new founded roads (i.e. see Detail A of the road construction detail drawings in Appendix C) is presented below.

1. Excavation of the new access road to competent strata (see Section 3 for guidance on correctly handling and storing the different peat layers). Maximum excavation side slopes will be 1:1.5.
    a. Drainage shall be installed to divert surface and groundwater from the construction areas.
2. A layer of geogrid/geotextile may be required at the base of the excavation. To be confirmed at detailed design.
3. Placement of granular fill-in layers following the designer's specification. The fill thickness is 200mm above the existing ground level, which is required to backfill the excavation to a suitable competent strata below the existing ground level.
4. Access roads are to be finished with a granular running surface across the full width of the road.

The general methodology to construct new floating roads (i.e. see Detail B of the road construction detail drawings presented in Appendix C) is presented below.

1. A geotextile-geogrid composite layer is placed directly onto the peat surface following the designer's specification.
2. Placement of granular fill up to 800mm and reinforcing geogrids in layers following the designer's specification, with due regard to any settlement and deformation of peat anticipated at the access track.
    a. Cross-drains shall be installed within the road to divert surface and groundwater from upslope to downslope.
    b. Stone delivered to the floating road construction area shall be end-tipped onto the constructed floating road to avoid excessive impact loading on the peat due to concentrated end-tipping. Direct tipping of stone onto the peat shall not be carried out.
    c. Stone will be spread and placed from the constructed floating road onto the peat surface using a bulldozer.
3. Access roads are to be finished with a granular running surface across the full width of the road.

No excavations (e.g., drainage or peat cuttings) shall be carried out within 5m of a completed floated access road edge or at a distance determined following a site inspection by the Contractor's Geotechnical Engineer.

The presence of excavations can destabilise the road. Where required, for example, for the installation of internal cabling offset from the footprint of the floated road, temporary excavations will be excavated in short lengths and backfilled as soon as practicable. These works will be designed and supervised by the Contractor's Geotechnical Engineer.

Spoil materials can be used for landscaping along the edge of access road sections to aid with the enhancement of the peatland areas and embed the access roads into the surrounding environment where slope and ground conditions allow, limiting their ecological and environmental impact. Consideration must be given to the placement of excavated materials in areas of potential instability or additional mitigation requirements, as highlighted in the PSRA (GDG, 2023). Where permissible, excavated materials will be placed to a maximum height of 1m and stockpile widths of a minimum of 2 to 3m unless site-specific detail designs allow larger volumes to be placed. Large stockpiles of materials shall not be placed on or adjacent to floated access roads to avoid bearing failure of the underlying peat.

Peat placement or landscaping will be carried out only in areas where it is topographically contained and does not create a propagated landslide risk – see PSRA (GDG, 2023).

For this development, particular buffer areas, including construction buffers, have been highlighted in the PSRA (GDG, 2023) and are presented in Appendix A.

4.2 Construction Methodology to Upgrade Existing Roads

An indicative methodology to upgrade existing founded roads (i.e. see Detail C of the road construction detail drawings presented in Appendix C) is presented below.

1. Excavation on one or both sides of the existing access road to competent strata.
2. Placement of granular fill up to 200m above existing ground level and reinforcing geogrids in layers following the designer's specification, with due regard to any settlement and deformation of peat anticipated at the access track.
3. Overlay of the existing access road with selected granular fill following the designer's specification.
    a. Where coarse granular fill has been used in the existing floated access road make-up, a layer of geogrid will be placed on top of the existing floated access road.
4. Access roads will be finished with a granular running surface across the full width of the road.
    a. A layer of geogrid/geotextile may be required at the surface of the existing access road following the designer's specification.

An indicative methodology to upgrade existing floating roads (i.e. See Detail D of the road construction detail drawings presented in Appendix C) is presented below.

1. A geotextile is placed on one or both sides of the existing access road directly onto the peat surface, following the designer's specification.
2. Benching of existing road and placement of granular fill and reinforcing geogrids in layers following the designer's specification, with due regard to any settlement of peat anticipated for the widened area.

   a. It may be necessary to stage the widening to maintain peat stability – i.e., to reduce the fill placement rate to allow the peat layers to consolidate and increase in strength.
   b. It may be necessary to anchor the geogrids into the existing roads, requiring significant benching of existing roads.
3. Overlay of the existing access road with selected granular fill following the designer's specification.
   a. Where coarse granular fill has been used in the existing floated access road make-up, a layer of geogrid will be placed on top of the existing floated access road.
   b. The surface of the existing access road will be graded/levelled before the placement of any geogrid/geotextile, where necessary (to prevent damaging the geogrid/geotextile).
4. Access roads are to be finished with a layer of capping across the full width of the road.
   a. A layer of geogrid/geotextile may be required at the surface of the existing access road following the designer's specification.

Where there are cross slopes, any road widening works required will be carried out on the upslope side of the existing access road, where possible. Particular design details will be required at the detailed design stage at the transitions between floating and founded roads to reduce differential settlements between the two construction types.

4.3 Construction Methodology for Cable Trenches

The proposed 220kV cable route between the substation and the public road is considered as part of this PSMP with the cable route construction within the existing public road is not expected to generate any surplus peat. The cable route is proposed to be constructed within new access roads, varying in width from 3.5m to 6m, as proposed by MKO. Most of the route is proposed to be constructed within a new founded access road; however, part of the proposed route, totalling 460m, passes through an area of peat >1m in thickness. Therefore, it has been proposed that part of the route be constructed within a section of the floated access road (Figure 4-1).

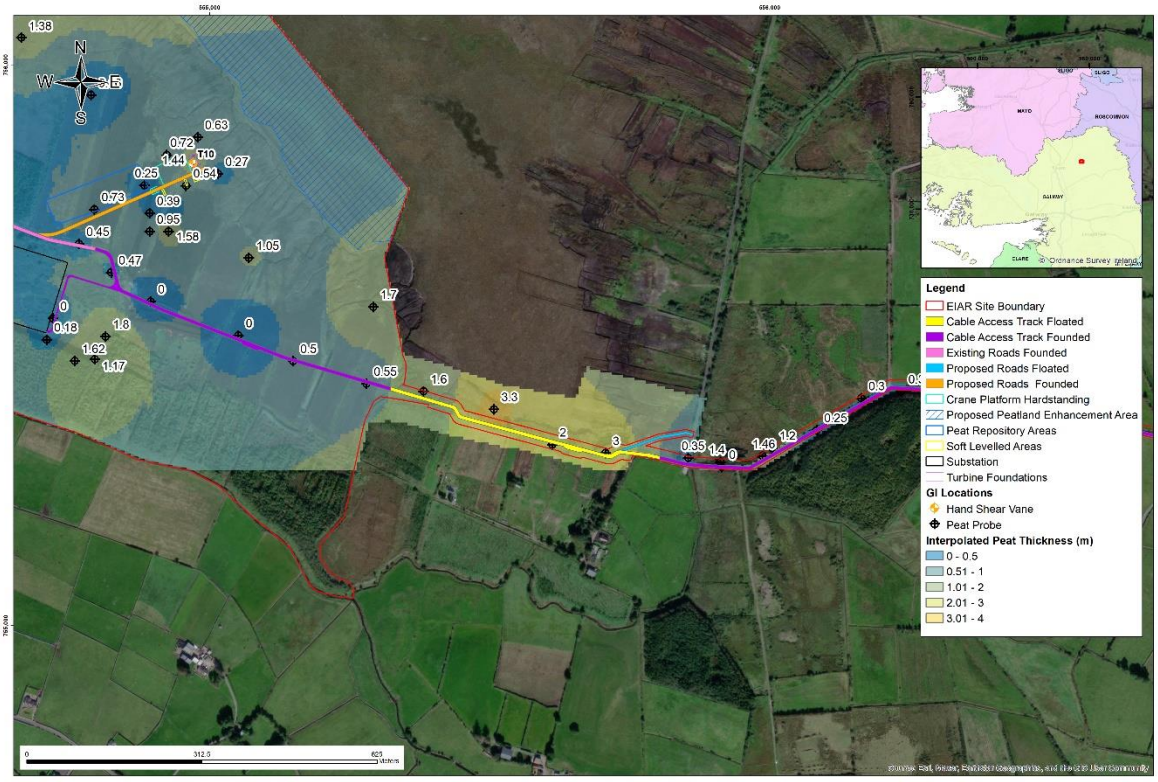


Figure 4-1: Location of floated cable sections.

An indicative methodology to construct cable trenches within new founded roads (i.e. see Detail 01 of the cable trench construction detail drawings in Appendix D) is presented below. It is recommended that the cable tenches are progressed ahead of the access tracks.

1. Excavation of the new access road to competent strata (see Section 3 for guidance on correctly handling and storing the different peat layers). Maximum excavation side slopes will be 1V:1.5H (subject to temporary works design).
    a. Drainage shall be installed to divert surface and groundwater from the construction areas.
2. Cable trenches are to be dug within the road footprint into the underlying bearing stratum to a suitable depth to allow installation of the ducting (as per the cable design requirements).
3. No more than a 50m section of trench is recommended to be opened at any one time. The subsequent 50m will only be excavated once most of the reinstatement has been completed on the preceding section.
4. Grade, smooth and trim the cable trench floor when the required excavation depth and width have been obtained.
5. A layer of geotextile is to be installed at the base of the trench excavation, overlapping with the geotextile layer (if required) at the interface between the access track's granular fill and the natural subgrade. The technical specification of the geotextile is to be confirmed at the detailed design stage.
6. The cable ducts shall be installed to the designer's specification and carefully surrounded and covered by rapid hardening wet concrete (grade C25/30) to specified depths. If the top

of the concrete is to be installed above the formation level of the access track, suitable formwork may be required to allow the proposed concrete cross-section to be formed.

7. A layer of geogrid may be required at the base of the the access track's granular fill. To be confirmed at detailed design.
8. Placement and compaction of access track fill shall be completed in layers following the designer's specification. The top of the access track is proposed to be 200mm above the existing ground level, with the remainder of the access track's fill thickness to backfill the excavation to a suitable competent strata below the existing ground level. The fill above the cable trench shall be upfilled with Clause 804 material (UGM-A as per Series 600 Specification, TII 2013), while the general fill either side of the Clause 804 is to be a Class 1 material.
9. Access roads are to be finished with a granular running surface across the full width of the road.

An indicative methodology to construct cable trenches beneath new floating roads (i.e. see Detail 02 of the cable trench construction detail drawings presented in Appendix D) is presented below. It is recommended that the cable tenches are progressed ahead of the floated access tracks to avoid damage and/or replacement of the geotextile and/or geogrid layers.

1. Bog matts or other temporary access solutions shall be placed on the insitu material as required.
2. Cable trenches are to be dug within the peat to a suitable depth to allow installation of the ducting (as per the cable design requirements). Peat will be excavated to the required depth and removed for placement in designated peat repository areas elsewhere on site.
3. No more than a 50m section of trench will be opened at any one time. The subsequent 50m will only be excavated once most of the reinstatement has been completed on the preceding section.
4. Grade, smooth and trim the cable trench floor when the required excavation depth and width have been obtained.
5. A geotextile-geogrid composite layer is to be installed at the base and around the sides of the trench excavation, directly onto the peat, as shown in Detail 02 in Appendix D, overlapping with the existing geotextile-geogrid composite layer at the base of the granular fill. The technical specification of the geotextile-geogrid composite layer is to be confirmed at the detailed design stage.
6. Ducts are to be installed to the designer's specification and carefully surrounded and covered by rapid hardening wet concrete (grade C25/30) to specified depths.
7. Placement and compaction of granular fill up to 800mm and installation of the reinforcing geogrids in layers following the designer's specification, with due regard to any settlement and deformation of peat anticipated at the access track.
    a. The fill above the cable trench shall be upfilled with Clause 804 material (UGM-A as per Series 600 Specification, TII 2013).
    b. The general fill either side of the Clause 804 is to be a Class 1 material.
    c. Cross-drains shall be installed within the road to divert surface and groundwater from upslope to downslope.

d. Stone delivered to the floating road construction area shall be end-tipped onto the constructed floating road in a manner that will avoid excessive impact loading on the peat due to concentrated end-tipping. Direct tipping of stone onto the peat shall not be carried out.
e. Stone will be spread and placed from the constructed floating road onto the peat surface using a bulldozer.

8. Access roads are to be finished with a granular running surface across the full width of the road.

Based on the available ground investigations and observed peat characteristics (Section 2.4), it is considered that cable trenches will be stable, provided the methodologies and best practice guidelines outlined in this report are followed. No additional excavations (e.g., drainage or peat cuttings) shall be carried out within 5m of a completed floated access road edge or at a distance determined following a site inspection by the Contractor's Geotechnical Engineer.

5 EXCAVATION OF TURBINE BASES, HARDSTANDINGS, AND INFRASTRUCTURE FOUNDATIONS

An assessment of the ground conditions encountered in the ground investigations indicates that the site's ground conditions are generally flat cut over raised peat bog, with some areas of glacial till. The average peat thicknesses identified at the proposed turbine and hardstand areas are less than 1m, except for T07, T08 and T11, where peat thicknesses are 3.5m, 1.7m and 1.7m, respectively. Where peat is present, the material encountered beneath it is generally a layer of soft to firm cohesive glacial till, or sandy gravelly granular glacial till. Generally, for constructing any structure or platform foundation, such as a turbine base, hardstand or substation, removing all soft material is required to a depth where a suitable bearing material is encountered. Rock breaking is not considered to be required at any turbine locations.

The non-peat excavated material must be properly managed and, as discussed in Section 2.1.1, will be assessed for reusability, and suitable granular material will be reused in other elements of the proposed wind farm design.

During turbine construction, peat will be excavated to a competent stratum for the concrete turbine foundation and a small working area surrounding the foundation footprint. Turbine bases of 25m in diameter are proposed, with detailed foundation design dictated by the local ground conditions and the requirements of the turbine supplier. A piled foundation is proposed at T7 due to the thick peat encountered (up to 5m), to be confirmed at the detailed design stage. Gravity foundations will be utilised at T1-T4 with precast piles the only alternative being considered at these locations . This foundation will require the excavation of peat and spoil to a sufficient depth to allow the installation of the piling platform beneath the concrete foundation.

The design of the turbine base foundations is subject to confirmatory ground investigation and assessment.

Similarly, all turbine crane hardstands will be founded on a suitable bearing material requiring the excavation of all peat and other soft ground materials, where present. The platform will be constructed in the excavated area using a suitable specified engineered stone fil. Following the placement of the platform, the excavated peat can be reused to batter the platform edges and landscape the platform back into the existing topography.

The mean peat depths collected from the ground investigations at each foundation and hardstanding location are used to calculate the estimated peat volumes. This is outlined further in Section 8.

6 AREAS PROPOSED FOR PEATLAND ENHANCEMENT

The proposed project includes an area of currently drained raised bog, used previously for turbary cutting, which is proposed to be enhanced by rewetting. This process aims to establish a hydrological regime that will allow for the resumption of peat accumulation in the area. This will allow the enhanced area to act better as a carbon sink.

The location of the proposed peatland enhancement area can be seen in Figure A-1-1 in Appendix A and Figure 6-1. The proposed area consists of a section of raised bog (maximum peat thickness from probes recorded at 3.88m, average peat thickness recorded at 2.8m), with parallel drains running NW to SE, roughly every 10-15m across the peat surface. The depth of the existing drains is estimated, based on site walkovers, to be between 0.5 m and 1m. Due to access constraints, only small sections of the area proposed for enhancement have been visited as part of this assessment. The current condition of the drained peat can be seen in Figure 6-2. Peat stability at this location has been assessed as part of the PSRA (EIAR Technical Appendix 8-1).

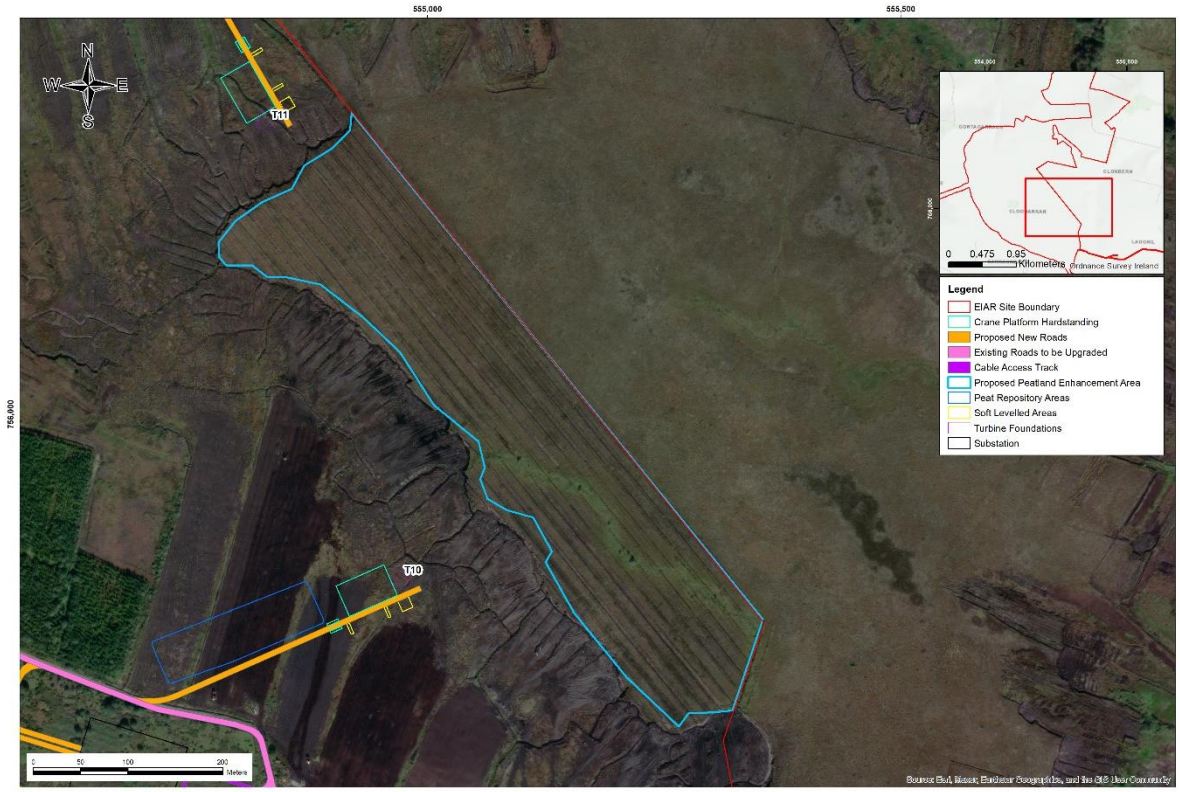


Figure 6-1: Location of the proposed peatland enhancement area.

Figure 6-2: Parallel drainage ditches at the north end of the proposed peatland enhancement area.

6.1 METHODOLOGY FOR PEATLAND ENHANCEMENT

In this instance, it is proposed that the peat will be rewetted by blocking the drains with peat dams being installed at the end of the drains and at 20m intervals along the drains, in line with the best practice outlined by Mackin et al. (2017) and McDonagh (1996). This will reduce drainage from the area and allow the water table to rise, allowing for peat accumulation to occur within the rewetted peat body.

The process involves clearing the drain and creating a 'key' in the drain sides to maintain a tight seal. The drain is subsequently blocked with small volumes of locally excavated acrotelmic peat by placing several layers of peat until it is built up to above the ground surface, after which it is covered with a 'scraw' (or sod) of vegetation. Depending on the surface conditions, this process may be carried out using a small excavator or by hand. The peat excavations adjacent to the peat dam locations will be limited in volume as far as possible. It is considered best practice to limit the number of dams to fewer than 10 per 100m to avoid excessive disruption to the peat surface. An example of a drain blocked by peat dams is illustrated in Figure 6-3 (adapted from Mackin et al., 2017).

Figure 6-3: Example of a peat dam at Moyarwood Bog, Co. Galway. Water table has risen to the surface within the drain, and in surrounding areas (Adapted from Mackin et al., 2017).

Peat excavated for use in constructing peat dams is proposed to be utilised entirely in the rewetting process, and as such is not considered in the peat balance calculations outlined in Section 8.

7 BORROW PIT

Excavation of a new borrow pit is proposed as part of the Proposed Project, as shown in Appendix A and E. A limited amount of overburden excavation will be required as part of the borrow pit excavation, as the area comprises up to 1m of overburden material. The peat depths within the development footprints of the borrow pits are estimated to be negligible and very limited peat excavation is expected (Figure 7-1). The overburden excavated from the borrow pit is proposed to be used for some reinstatement within the borrow pit once extraction is completed, with the remainder exported to a licensed waste facility over the course of the construction phase of the project.

The proposed borrow pit is to be excavated in an area of glaciofluvial sands and gravels, which have previously been the subject of extraction under a previous consent, revealing a bedrock outcrop. The bedrock comprises the Burren Formation, characterised by pale grey clean skeletal limestones.

Figure 7-1: Photo looking east across the proposed borrow pit, with no peat visible.

The excavated rock from the borrow pit will be used in the construction of the infrastructure elements (turbine bases, roads, etc.) at the Proposed Project. An example excavation profile

showing the profile through the proposed borrow pit is shown in Appendix E. Where necessary, the project design engineer will determine the appropriate excavation depth.

A preliminary assessment of the proposed borrow pit rock material by face geological mapping suggests that it is suitable for producing engineered fill and could be excavated by breaking or blasting and processed to the detailed design engineered fill requirements. The suitability and processing of the bedrock material will be subject to further GI and laboratory testing assessment at the detailed design stage to confirm the suitability and acceptability of the fill material for certain applications (e.g. Class 1C, 6N2, UGM-A, etc).

Slopes within the excavated rock formed around the perimeter of the pit borrow pit will be formed at stable inclinations to suit local in-situ rock conditions. It is proposed to excavate the borrow pit to 12m bgl. Where necessary, an interceptor drain will also be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit, preventing water from ponding and lodging in the borrow pit area. Groundwater management at the proposed borrow pit will be necessary to avoid ponding, and pumping will likely be required. The detailed design will need a drainage and groundwater management plan for the borrow pit area.

Upon removal of the overburden and rock from the proposed borrow pit, it is not proposed to reinstate the borrow pit using surplus excavated peat and spoil generated onsite during the construction of the Proposed Project. The final profile will vary across the base of the borrow pit. The volume assessment at the borrow pit suggests that the available stone fill capacity is lower than the stone requirements at the site, meaning that the import of stone from external sources will be required to complete the development.

An indicative layout of the proposed borrow pit is presented in Appendix E.

8 PEAT AND SPOIL VOLUMES

The ground investigation and design layout drawings have been reviewed to inform this section of the PSMP. Peat volumes can be estimated based on the results of intrusive investigations and the Proposed Project's design.

Peat excavation will be required for the following elements of the Proposed Project:

1. Founded and upgraded access roads;
2. Turbine hardstands and foundations (including crane pads);
3. Cable Trenches, and
4. Substation.

A preliminary estimate of the approximate volumes of excavation and fill needed to construct the Proposed Project was carried out. This was produced using typical limits to road and hardstand gradients and using road and hardstanding thickness typical to the ground conditions of the Proposed Project.

8.1 PEAT AND SPOIL EXCAVATION VOLUMES

The peat depths examined in the GI were reviewed at the infrastructural elements of the Proposed Project, such as each turbine, crane hardstand, borrow pit location and access tracks. The average peat depths at each structure were incorporated into the model along with the turbine and hardstand layout, access roads alignment and other associated infrastructures to estimate the volume of peat proposed to be excavated.

A breakdown of the estimated peat excavation volumes is summarised in Table 8-1.

Table 8-1: Summary of preliminary excavation volumes

Infrastructure Item	Approximate Area (m2)	Average Peat depth (m)	Excavated peat volume (m^3)*	Excavated spoil volume (m^3)
New Access Roads (founded)	56,100	0.3	16,060	350
Upgraded Access Road -including road to be widened (founded)	15,500	0.3	3,080	0
Cable Trenches	7,900	-	1,520	2,180
Turbine foundations	5,100	0.9	7,590	17,270
WTG Hardstands	23,300	0.7	18,480	0
Substation	13,600	0.2	3,520	13,830
Borrow Pit	20,000	0	**0**	14,456**
Total	**141,500**		**50,250**	**48,086**

* The volume of peat material excavated has been estimated using the average peat depth calculated across the footprint of the structure to define the basal surface of the peat.
** A small amount of spoil excavated from the borrow pit is proposed to be reinstated within the borrow pit, with the remainder proposed to be exported to a licensed waste facility over the course of the construction phase of the project. This volume is therefore not considered in the balance calculations below.

8.2 PEAT REINSTATEMENT VOLUMES

Peat generated during construction can be reused or reinstated across the development. Peat may be reused for landscaping on edges of constructed infrastructure (including road verges, around hardstand area and turbine foundations) and shall be placed as soon as reasonably practical after construction. This shall act as part of the landscaping Enhancement and tie in with surrounding topography, reducing visual impacts and restoring the existing habitat.

Several considerations have been made in the estimation of reinstatement volumes:

- A conservative reinstatement volume of $2m^3$ per linear metre (lin.m) of the new access road ($1m^3$ placed on each side of the trackway) has been used. This can often be increased to up to $4m^3$ per lin.m following the detail design stage and the appropriate stability design considerations,
- A conservative reinstatement volume of $1m^3$ per lin.m on existing access road widenings, accounting for placement of $1m^3$ on one side only side of the proposed widening trackway,
- A conservative reinstatement volume of $1m^3$ per lin.m on existing access road upgrades, accounting for placement of $0.5m^3$ on each side of the roads to be upgraded,
- An estimated reinstatement capacity of $3m^3$ per external lin.m perimeter of hardstand areas such as the crane hardstands and temporary construction compounds,
- A conservative estimate of 20% of the total cohesive spoil volumes has been considered as available for reuse in the construction of safety berms across the site.
- Four Peat Repository Areas and one Spoil Repository Area have been identified for the permanent placement of peat and spoil material.

Potential peat and spoil reuse/reinstatement volumes have been estimated and are also presented in Table 8-2 and Table 8-3.

Table 8-2: Summary of preliminary peat reinstatement volumes

Comment	Peat Reinstatement capacity volume (m^3)	Comments
New Access roads (founded)	13,270	Placement of arisings 2m^3/lin.m alongside existing and new founded roads, where topography allows.
New Access roads (floated)	3,190	
Upgraded Access roads (founded)	1,360	Placement of arisings 1m3/lin.m alongside upgraded roads, where topography allows..
Upgraded Access roads (floated)	170	
Turbine foundations and hardstands (11nr.)	5,050	Placement of arisings 3m^3/lin.m of external hardstand perimeter, where topography allows.
Compound (2nr)	1,290	Placement of arisings 3m^3/lin.m of external compound perimeter, where topography allows.
Substation	650	Placement of arisings 3m^3/lin.m of external substation perimeter, where topography allows.
Peat Repository Areas	30,500	1m peat placement within peat repository areas, with a reduction to account for constructing a 3m cell berm.
Total	**55,480**	

Table 8-3: Summary of preliminary spoil reinstatement capacity volumes

Comment	Spoil Reinstatement volume (m^3)
20% Reinstatement of Total Volume	6,740
Spoil Stockpile Areas	31,530
Total	**38,270**

The volumes quoted in Table 8-2 and Table 8-3 reflect normal earthworks practice where volumes of cut and fill are evaluated on a 1m^3 cut to 1 m^3 filled basis. It is acknowledged that bulking can occur where placed soils occupy a greater volume due to a reduction in density. It is considered that bulking will be offset to a considerable degree by the compaction of soils during placement and subsequent settlement to achieve the volumes outlined.

At the construction stage, the peat stability risk assessment will be updated to include consideration of the peat stability and landslide risks arising from variations to the layout which may occur during the construction stage.

A preliminary assessment has been undertaken to assess peat and spoil material placement and reinstatement. This assessment indicates that stability is acceptable. A detailed assessment must be undertaken as part of the detailed design when locations are confirmed and additional GI information becomes available.

The Contractor will conduct a confirmatory construction stage Peat Stability Risk Assessment to investigate the peat stability and landslide risks arising from variations to the layout that may occur during the detailed design and/or construction stage.

At this stage, no peat volume requirement has been identified for the peatland enhancement area, as it is considered that peat will be excavated from small excavations local to each peat dam and placed immediately. Alternatively, where the drain flows require it, plastic dams may be used. These excavations are, therefore, not considered as part of the overall peat balance.

8.3 PEAT BALANCE

The volume balance of excavated and reinstated peat is outlined in Table 8-4. This table outlines the estimated volumes of peat excavation and the reinstatement volumes as outlined in Sections 8.1 and 8.2.

Table 8-4: Peat and spoil balance assessment

ITEM	SUPPLY	DEMAND	BALANCE
	Excavation Volume (m^3)	Reinstatement Capacity (m^3)	Surplus (+) or Deficit (-) (m^3)
Peat Balance	50,250	55,480	-5,230
Spoil Balance	33,630*	38,270	-4,640
TOTAL	**83,880**	**93,750**	**-9,870**

*The 14,456m^3 excavated from the borrow pits is not proposed to be managed on-site and so is excluded from this calculation. The total volume of spoil to be managed on-site is 33,630m^3.

The preliminary earthwork volume summary indicates that the development's peat and spoil placement capacity, provided once the peat repository areas are reinstated, exceeds the volume of peat excavated for the various infrastructures.

The summary of earthwork volumes indicates that the peat placement capacity of the Proposed Project Site is greater than the volume of peat excavated for the various infrastructures.

9 GUIDELINES FOR GOOD CONSTRUCTION PRACTICE

9.1 GENERAL

Inappropriate handling and management of excavated peat and overburden and uncontrolled loading of peat material are two of the leading causes of peat instability and landslide event triggers during the wind farm construction process. Managing and controlling these activities is key to de-risking peat stability at the wind farm site. It is required that the construction method statements for the project also consider, but are not limited to, the guidance documents listed in Section 1 and the recommendations and requirements outlined throughout this document.

The general requirements for the management of peat and spoil materials and the mitigation of peat instability at the site:

- A Project Geotechnical Engineer shall be appointed to oversee peat excavation and management for the construction stage.
- Placement of peat material, including temporary and side casting, shall be carried out in the permitted areas only. No peat material shall be stored, side cast, or used for landscaping in the designated Safety Buffer Areas,
- Excavated peat shall not be stored on-site and will be immediately moved to the designated peat repository areas. Acrotelm (upper) peat material will be used as landscaping material where topography allows, and the detail designer has assessed the stability risk,
- Peat and spoil will only be placed in the proposed repository areas or reused for landscaping. The velocity of water flows within drainage systems will be controlled using check damns, and the uncontrolled release of water onto slopes can create a landslide risk and must be avoided,
- All construction requiring cut and fill earthworks requires a robust monitoring and inspection programme. The details of this inspection programme will depend on the purpose and methodologies of the works and the ground conditions,
- A method statement and risk assessment (RAMS), which considers the potential causes and mitigations of peat instabilities and landslides, is required and shall be regularly communicated to all site staff. An observational approach by all site staff to the ground conditions and the risks will be promoted, and any changes in the ground or site conditions will be reported and the risk dynamically assessed.
- Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting any observed change in ground conditions.

9.2 MONITORING

Installing movement monitoring posts is recommended for areas where works occur on or adjacent to identified peat depths greater than 2m and existing slope angles exceeding five degrees. At those locations, monitoring posts are recommended to be installed upslope and downslope of the works areas.

Movement monitoring posts shall be observed at least once daily during construction, with more frequent inspections where adjacent works are ongoing. Should movements be recorded, the frequency of these inspections is to be increased. A record of all monitor post inspections will be kept with reference to date, time and relative movement between posts, if any. Any movement

identified in the posts shall be recorded with reference to the post numbering system. The monitoring regime will be further developed and assessed during the detailed design phase.

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

9.3 CONTINGENCY MEASURES

The stability of the peat and overburden is considered safe for the construction activities proposed, and providing the peat and spoil are managed in line with the details of this document, the risk of a peat failure or landslide is negligible to very low. However, it is important to consider the actions that will be carried out if signs of instability are identified during the outlined monitoring or if a failure occurs at the site.

The full methodologies for these activities will be outlined in the construction Contractor's RAMS and include the methodologies for immediate and long-term response.

9.3.1 MOVEMENT OR INSTABILITY OBSERVED IN MONITORING AREAS

Where excessive movement has been observed in the installed monitoring outlined in 9.2 the following measures will be taken;

- All construction activities will be suspended in the area,
- The Contractor's Geotechnical Engineer shall assess the peat instability, including drainage. The Contractor's Geotechnical Engineer will compile a report outlining the surveys undertaken, the potential cause of the instability, the assessment of any increased risk caused by the instability, and the further measures required to manage this risk.
- An increased monitoring regime will be specified, including an increase in the number of monitoring post lines, a decrease in monitoring post spacing and an increase in the frequency of monitoring post observations.
- Providing no further movement is detected, construction activities will be recommenced while maintaining the increased monitoring regime.
- Should further excessive movement be detected, the contractor's design and project geotechnical engineer will be informed, and the design of further reinstatement works will occur, such as excavation of the disturbed material, installation of granular berms or similar.

9.3.2 EMERGENCY RESPONSE TO A LANDSLIDE EVENT

In the scenario of a landslide, bog burst or peat slide at the site, the following steps will be carried out by the Contractor:

- All project members will be alerted immediately or as soon as it is safe.
- All site works will be ceased, and all available resources will be used to manage and mitigate the risks posed by the event.
- The key initial activity will be to prevent displaced materials from reaching any watercourses or sensitive environments. Given the terrain of the Proposed Project site, the key risk is the development of a bog burst in proximity to watercourses. Where possible, check barrage

structures on land or within these watercourses, which will be constructed to minimise further runout of the disturbed peat or spoil material.

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

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

The use of check barrages is only proposed for use in the unlikely event of a large bog burst event. The Contractor will include an assessment of potential check barrage locations and method for their construction within the emergency procedures in their associated RAMS documentation.

10 RISK REGISTER

Table 10-1: Risk register.

Ref.	Risk	Cause	Mitigation
1	Excavation of larger quantities of peat than expected	Increase in peat depth encountered	This report outlines the calculations carried out in the peat balance exercise. The report outlines the volumes of peat excavation required for the construction of the Proposed Project and the capacity for the development for peat placement or rehabilitation, concluding that the peat balance is satisfactory for the construction of the Proposed Project. The peat depths used are developed from the ground investigations carried out at the site including peat probes, trial pits and hand shear vanes. Peat material can vary largely locally and the risk of missing a local deep area of peat can exist at the site. An increased density of ground investigation was carried out in the areas of proposed infrastructure. However, some areas had limited or no access and so ground investigations are limited. A conservative estimate of peat volumes has been taken into account in the volumes presented in Section 8. Road construction types have been considered based on a threshold of minimum 1m peat thickness for floated roads. If further GI chsnges the peat thickness calculation in areas proposed for floated road construction, or if this threshold is altered, then the pear excavation may change accordingly. Further GI will be required across the Proposed Project during the detail design and construction stage to assess peat depths and strengths. This will be carried out by the detail designer and Contractors team. The design team will develop their own peat balance calculation to satisfy and de-risk the possibility of larger peat excavation volumes being encountered at these locations.
2	Inadequate repository space for excavated peat	Inadequate peat reinstatement volumes	The peat balance calculation has considered a conservative estimate of the peat reinstatement quantities. Following detailed design it is likely that the reinstatement volumes will be able to be increased, targeting topographically confined areas for increased volume of side casting while still remaining in compliance with the requirements outlined in this Peat and Spoil Management Plan document and industry best practices. It is assumed that a suitable construction methodology and project timeline can be developed by the construction stage contractor and design team to manage peat excavations and placement areas effectively.
3	Peat slippage from side casting of	Overloading of in-situ peat by sidecasting	The PSRA report (EIAR Technical Appendix 8-1) examines the stability of the peat in several conditions, including the inclusion of a 1m peat placement surcharge. GI has been carried out, providing peat thicknesses at 229 locations,

Ref.	Risk	Cause	Mitigation
	peat material		and GDG is satisfied that the design at this stage is in line with the Scottish Guidelines for development on peatlands (Section). This report outlines the methodologies to safely carry out the construction of the Proposed Project, including the restriction for the placement of peat at some key infrastructure locations. The construction stage design and contractor team will need to construct the Proposed Project using these mitigation measures. Further confirmatory GI will be required across the full site including at the identified hazard areas during the detail and construction stage to assess peat depths and strengths. This will be carried out by the detailed designer and contractor's team. The design team shall develop their own testing criteria to satisfy and de-risk the possibility of instability and peat failure. The works will be undertaken by a competent contractor experienced in working in peat and soft ground conditions in upland areas and will have carried out the appropriate due diligence and assessment relating to peat stability and appropriate peat placement.

11 CONCLUSION

This PSMP has been prepared to outline a Peat and spoil management strategy to ensure the workable and sustainable management of peat during the construction of the Proposed Project.

This PSMP indicates that the majority of material excavated will comprise peaty soil and acrotelmic peat, with some excavations of catotelmic peat. The volumes of catotelmic peat generated will be fully utilised in the peat repository areas and are not considered to represent waste material.

For the purposes of the peat balance assessment completed herein, volumes of peaty soil have been included to facilitate an assessment of the superficial material required for enhancement and infrastructure dressing at the Proposed Project.

The peat balance analysis in Section 8 outlines a conservative estimate of the volumes of peat and spoil excavation and reinstatement during the construction of the Proposed Project, and as such, it is concluded that all of the peat material excavated can be reused safely on-site during construction. Should further refinement of the detailed infrastructure design be undertaken, the assessment completed herein will be revisited.

REFERENCES

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Scottish Renewables and SEPA (2012) *Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste*

Appendix A -Site Maps

A.1 Site Layout and Peat Thickness Plans

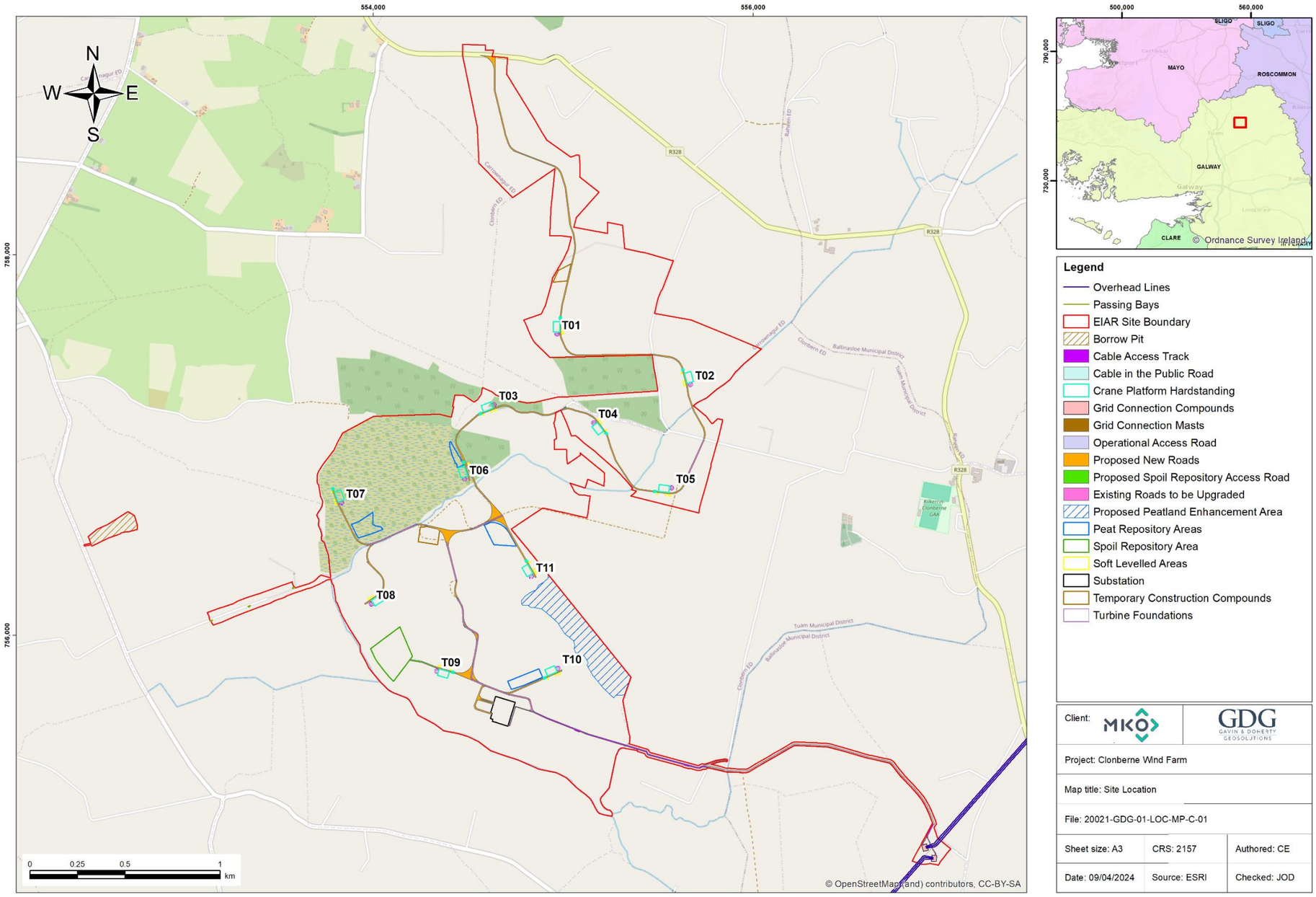


Figure A-1-1: Site Layout

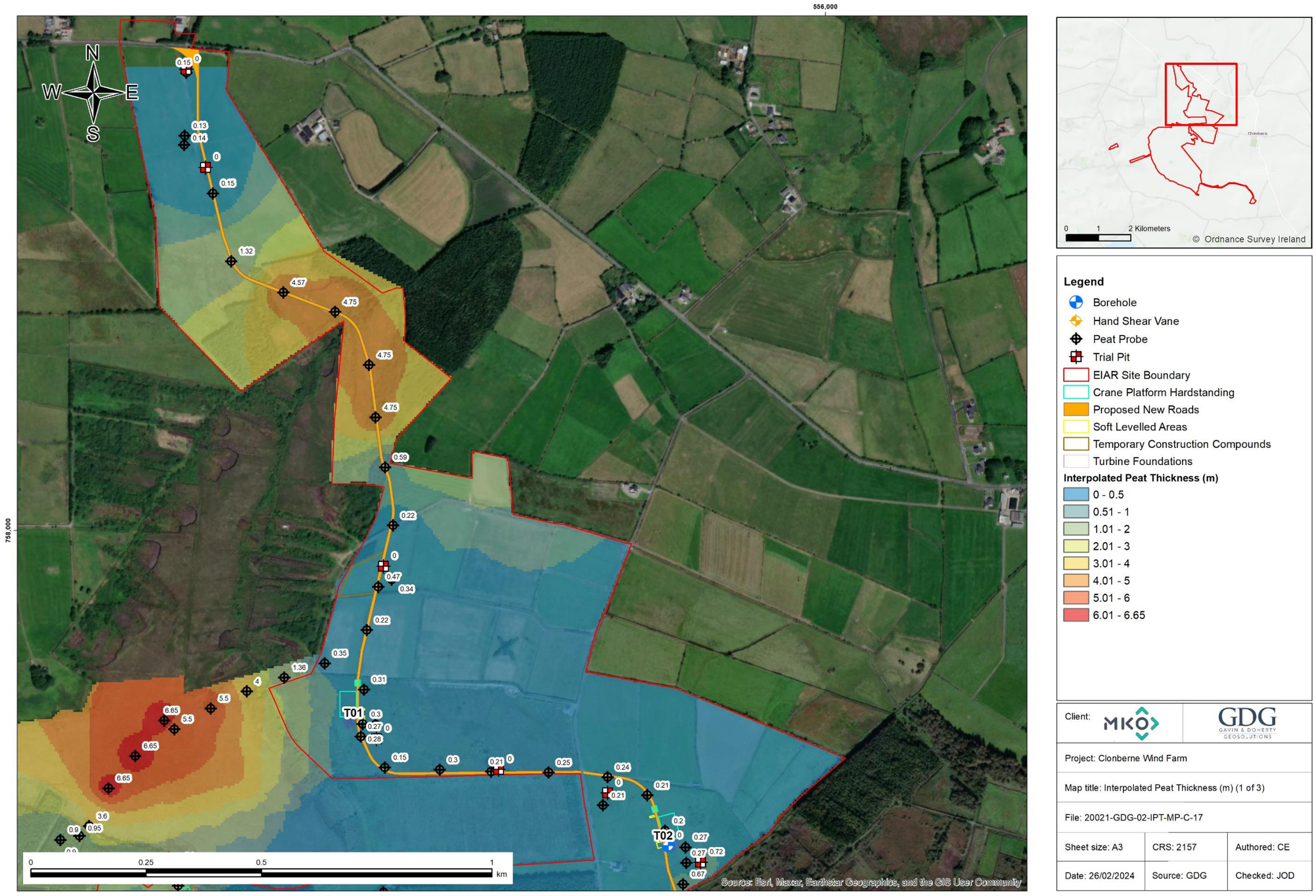
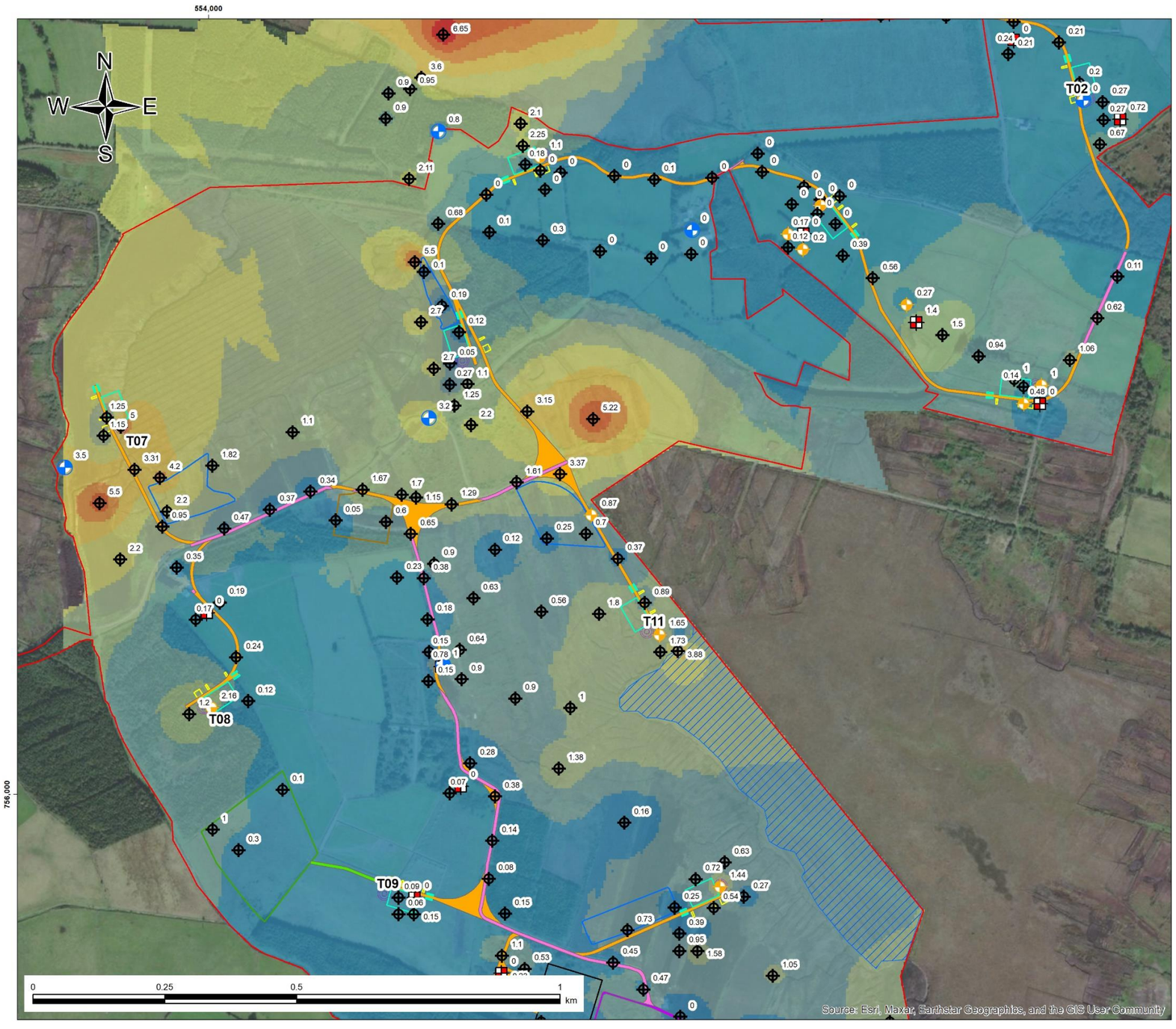
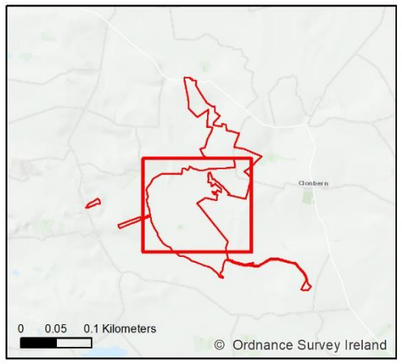


Figure A-1 2: Interpolated Peat Thickness (1 of 3).





Legend

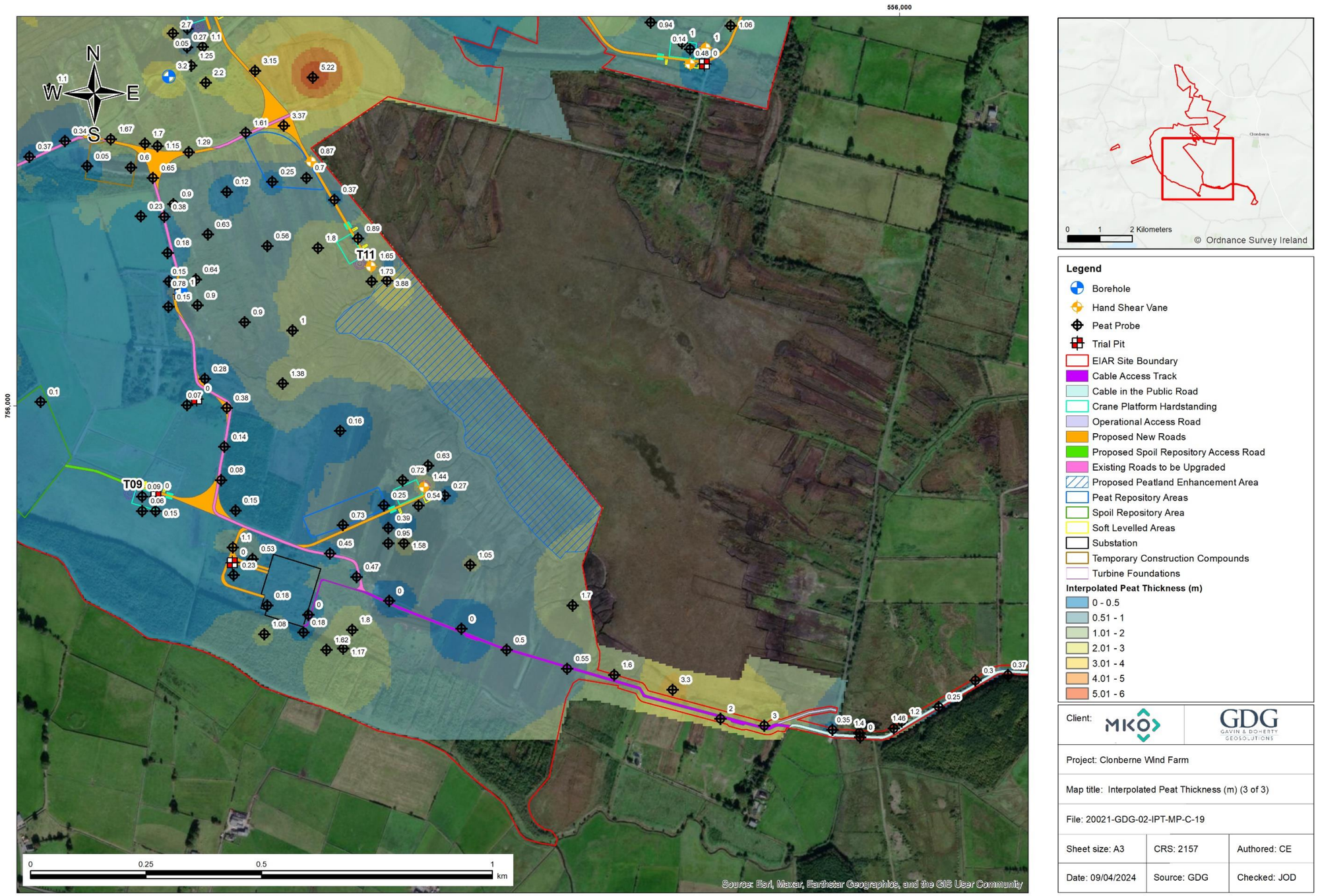
- Borehole
- Hand Shear Vane
- Peat Probe
- Trial Pit
- EIAR Site Boundary
- Cable Access Track
- Crane Platform Hardstanding
- Proposed New Roads
- Proposed Spoil Repository Access Road
- Existing Roads to be Upgraded
- Proposed Peatland Enhancement Area
- Peat Repository Areas
- Spoil Repository Area
- Soft Levelled Areas
- Substation
- Temporary Construction Compounds
- Turbine Foundations

Interpolated Peat Thickness (m)

- 0 - 0.5
- 0.51 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
- 5.01 - 6
- 6.01 - 6.65

Client: MKO	GDG GAVIN & DOHERTY GEOSOLUTIONS	
Project: Clonberne Wind Farm		
Map title: Interpolated Peat Thickness (m) (2 of 3)		
File: 20021-GDG-02-IPT-MP-C-18		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 09/04/2024	Source: GDG	Checked: JOD

Figure A-1-3: Interpolated Peat Thickness (2 of 3).



Legend

- Borehole
- Hand Shear Vane
- Peat Probe
- Trial Pit
- EIAR Site Boundary
- Cable Access Track
- Cable in the Public Road
- Crane Platform Hardstanding
- Operational Access Road
- Proposed New Roads
- Proposed Spoil Repository Access Road
- Existing Roads to be Upgraded
- Proposed Peatland Enhancement Area
- Peat Repository Areas
- Spoil Repository Area
- Soft Levelled Areas
- Substation
- Temporary Construction Compounds
- Turbine Foundations

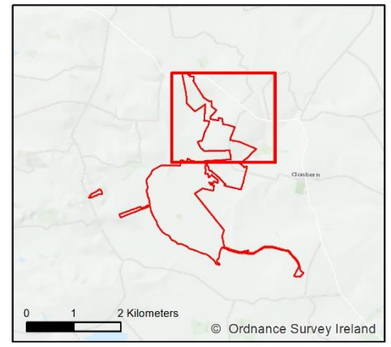
Interpolated Peat Thickness (m)

- 0 - 0.5
- 0.51 - 1
- 1.01 - 2
- 2.01 - 3
- 3.01 - 4
- 4.01 - 5
- 5.01 - 6

Client: MKO	GDG GAVIN & DOHERTY GEOSOLUTIONS	
Project: Clonberne Wind Farm		
Map title: Interpolated Peat Thickness (m) (3 of 3)		
File: 20021-GDG-02-IPT-MP-C-19		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 09/04/2024	Source: GDG	Checked: JOD

Figure A-1-4: Interpolated Peat Thickness (3 of 3).

A.2 Safety Buffer and Peat Stockpile Restriction Map



Legend

- Peat Stockpile Restriction Areas
- EIAR Site Boundary
- Crane Platform Hardstanding
- Proposed New Roads
- Soft Levelled Areas
- Temporary Construction Compounds
- Turbine Foundations

Client: MKO / GDG		
Project: Clonberne Wind Farm		
Map title: Safety Buffer and Peat Stockpile Restriction Areas (1 of 3)		
File: 20021-GDG-02-SBZ-MP-C-32		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 26/02/2024	Source: GDG	Checked: JOD

Figure A-2-1: Safety buffers and peat stockpile restriction zones (1 of 3).

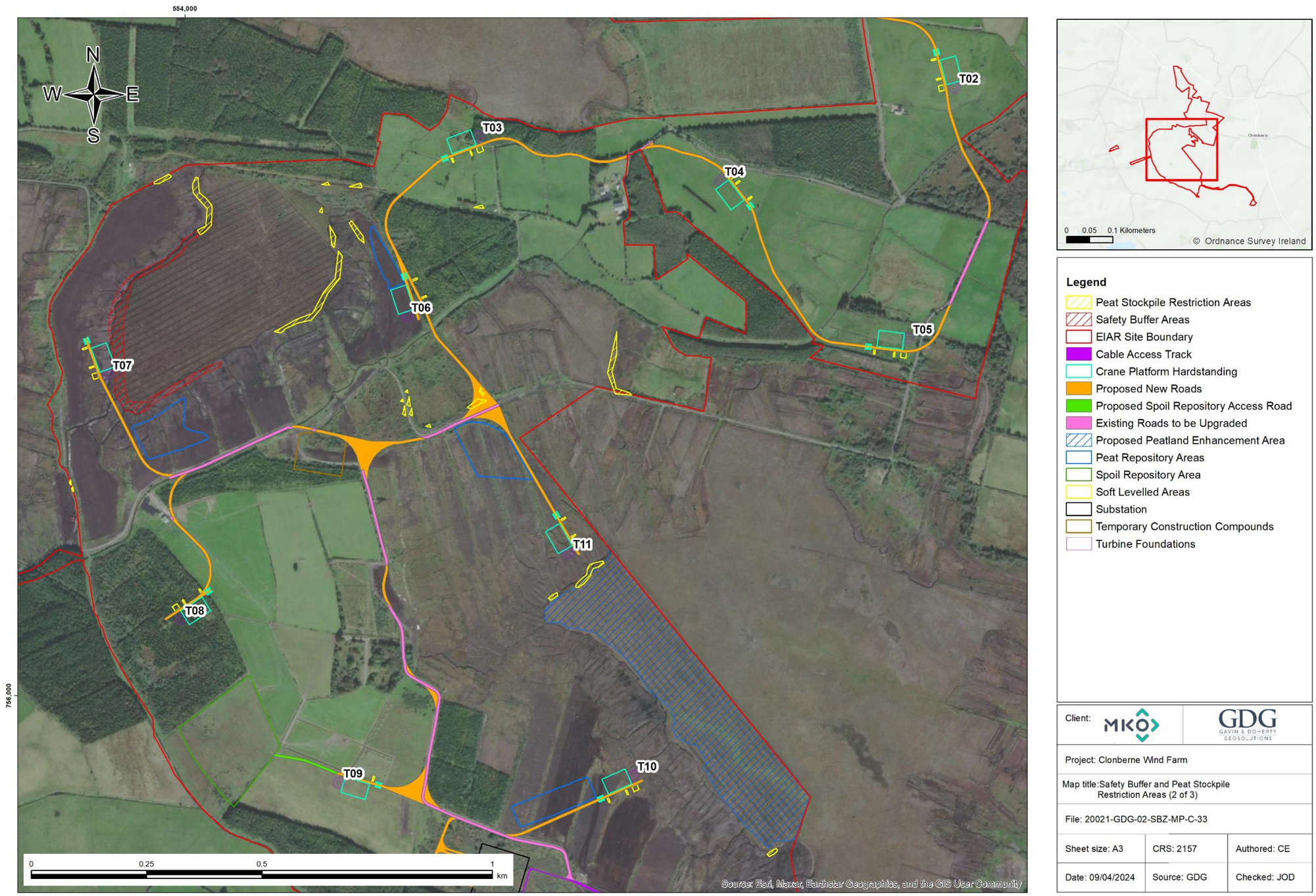
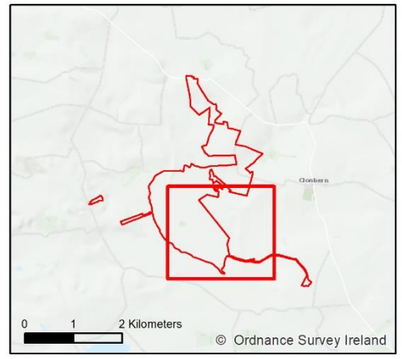


Figure A-2-2: Safety buffers and peat stockpile restriction zones (2 of 3).



Legend

- Peat Stockpile Restriction Areas
- EIAR Site Boundary
- Cable Access Track
- Cable in the Public Road
- Crane Platform Hardstanding
- Operational Access
- Proposed New Roads
- Proposed Spoil Repository Access
- Existing Roads to be Upgraded
- Proposed Peatland Enhancement
- Peat Repository Areas
- Spoil Repository
- Soft Levelled Areas
- Substation
- Temporary Construction Compounds
- Turbine Foundations

Client: MKO / GDG GAVIN & DOHERTY GEOSOLUTIONS		
Project: Clonberne Wind Farm		
Map title: Safety Buffer and Peat Stockpile Restriction Areas (3 of 3)		
File: 20021-GDG-02-SBZ-MP-C-34		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 09/04/2024	Source: GDG	Checked: JOD

Figure A-2-3: Safety buffers and peat stockpile restriction zones (3 of 3).

A.3 ROAD CONSTRUCTION TYPES

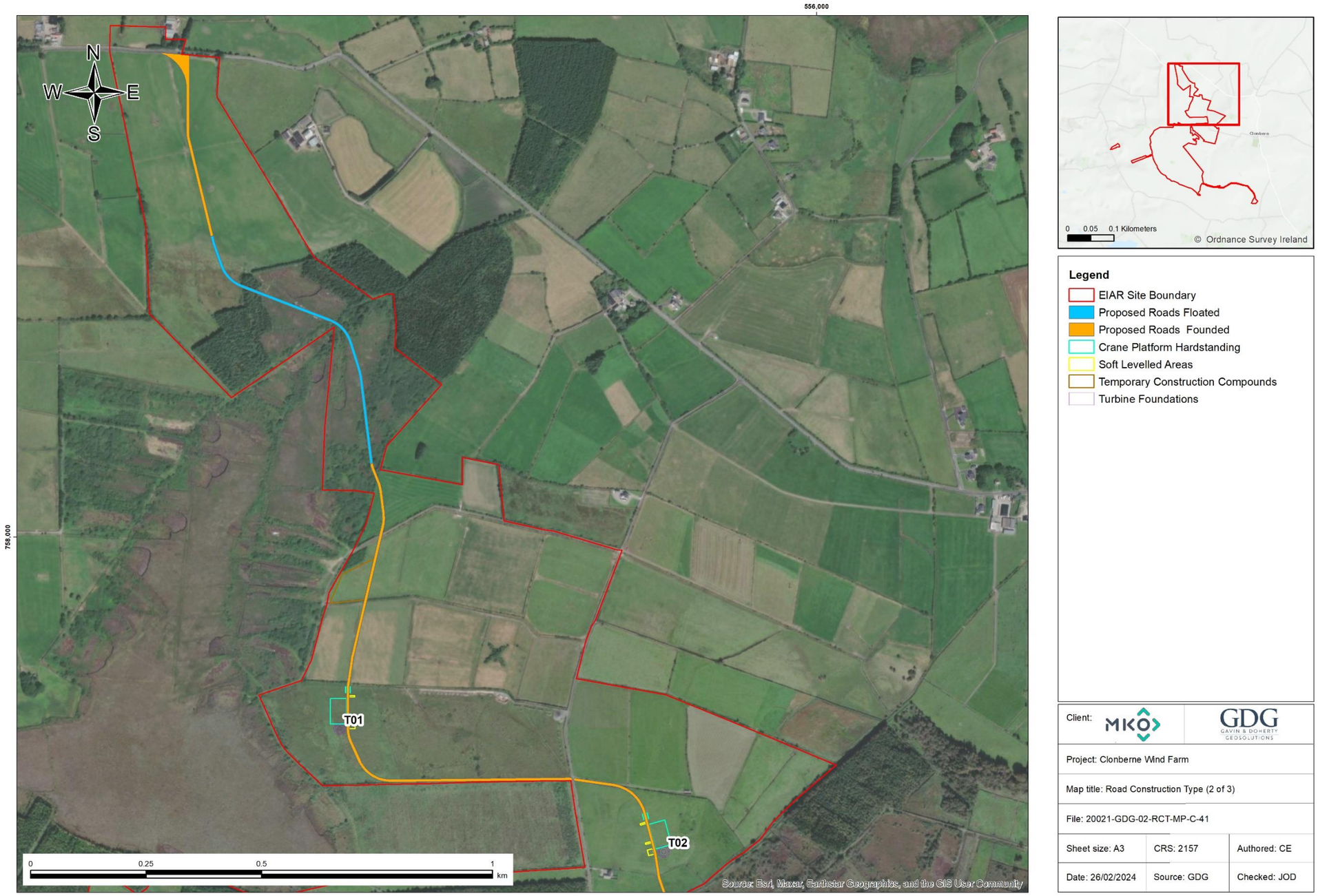
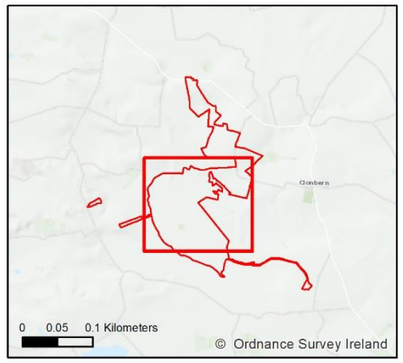


Figure A-3-1: Proposed road construction types (1 of 3).



Legend

- EIAR Site Boundary
- Cable Access Track Founded
- Existing Roads Floated
- Existing Roads Founded
- Proposed Roads Floated
- Proposed Roads Founded
- Crane Platform Hardstanding
- Proposed Spoil Repository Access Road
- Proposed Peatland Enhancement Area
- Peat Repository Areas
- Spoil Repository Area
- Soft Levelled Areas
- Substation
- Temporary Construction Compounds
- Turbine Foundations

Client: MKO / GDG GAVIN & DOHERTY GEOSOLUTIONS		
Project: Clonberne Wind Farm		
Map title:: Road ConstructionType (2 of 3)		
File: 20021-GDG-02-RCT-MP-C-41		
Sheet size: A3	CRS: 2157	Authored: CE
Date: 09/04/2024	Source: GDG	Checked: JOD

Figure A-3- 2: Proposed road construction types (2 of 3).

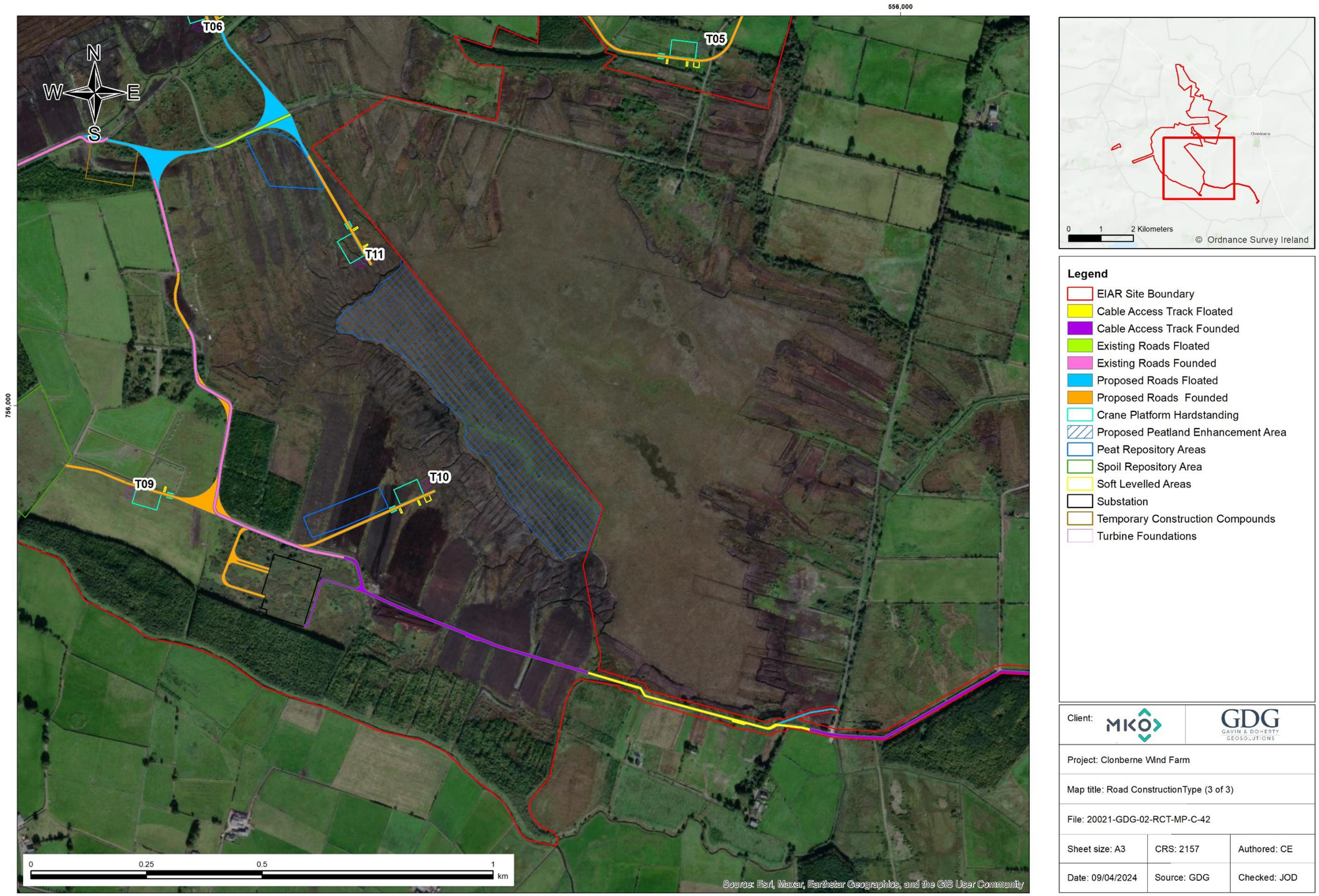


Figure A-3- 3: Proposed road construction types (3 of 3).

A.4 TRIAL PIT LOGS

GDG
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Trial Pit Log

TrialPit No
TP-01
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 553996.00 - 756344.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.50	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							TOPSOIL (grassland)
				0.20			Grey brown, stiff, high plasticity, sandy, gravelly CLAY.
				0.50			Light brown, loose to medium dense SAND with many cobbles and large boulders. Boulders and cobbles are rounded to subrounded.
▼							
				2.50			End of Pit at 2.50m

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Remarks:

Stability:

AGS

GDG GAVIN & DOHERTY GEOSOLUTIONS

Trial Pit Log

TrialPit No: TP-02
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554555.00 - 755661.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 3.55	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Peaty TOPSOIL with rootlet.
				0.29			Grey brown, stiff, sandy, gravelly CLAY with some cobbles.
				0.67			Light brown, loose to medium dense slightly clayey, gravelly SAND with cobbles. Gravel and cobbles are rounded to subrounded.
				1.60			Grey, dense, gravelly, silty, fine to coarse SAND with large cobbles and boulders subrounded to subangular.
				3.55			End of Pit at 3.55m

Remarks:

Stability:

AGS

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GEOSOLUTIONS

Trial Pit Log

TrialPit No
TP-03
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554478.00 - 756015.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 3.00	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.13			Brown TOPSOIL with rootlet.
				0.35			Brown, soft, medium plasticity, gravelly, very sandy CLAY.
				0.71			Grey, stiff, high plasticity, sandy, gravelly CLAY with boulders.
				3.00			Grey/brown loose to medium clayey/silty coarse SAND with large cobbles and boulders subrounded to subangular.
							End of Pit at 3.00m

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Remarks:

Stability:

AGS

GDG GAVIN & DOHERTY GEOSOLUTIONS

Trial Pit Log

TrialPit No: TP-04
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555527.00 - 757431.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m): Depth 1.20	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)			Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.17			Dark/brown TOPSOIL with rootlet.
				0.84			Dark grey , slightly silty, very sandy GRAVEL, with cobbles subrounded to rounded.
				1.20			Dark/grey very sandy GRAVEL with angular boulders and cobbles.
							End of Pit at 1.20m

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Remarks:

Stability:

AGS

GDG
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GEOSOLUTIONS

Trial Pit Log

TrialPit No
TP-05
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554441.00 - 756242.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.10	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Black/brown fibrous PEAT.
				0.56			Brown pseudo fibrous slightly clayey PEAT.
				0.78			Grey, firm to stiff, high plasticity, sandy, very gravelly CLAY. Gravel is subrounded to subangular. At 1.2 mBGL many cobbles and boulders.
				2.10			End of Pit at 2.10m

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Remarks:

Stability:

AGS

GDG GAVIN & DOHERTY GEOSOLUTIONS

Trial Pit Log

TrialPit No: TP-06
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555026.00 - 757548.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.30	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25			Dark brown TOPSOIL with rootlet.
				0.72			Grey, stiff, medium strength, sandy, very gravelly CLAY.
				2.30			Dark grey soft, low strength, gravelly sandy, slightly clayey SILT with cobbles and boulders. Cobbles are gneiss angular, block with veins of quartz. End of Pit at 2.30m

Remarks:

Stability:

AGS

GDG GAVIN & DOHERTY GEOSOLUTIONS

Trial Pit Log

TrialPit No: TP-07
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555729.00 - 757280.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m): Depth 2.80	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)			Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			TOPSOIL.
							Dark brown pseudo fibrous PEAT.
				0.72			Creamy grey, slightly organic, sandy, gravelly, silty CLAY with high cobble content. Cobbles are subrounded to subangular. Sandy lense at 1.6m.
▼				2.80			End of Pit at 2.80m

1 2 3 4 5

Remarks:

Stability:

AGS

GDG GAVIN & DOHERTY GEOSOLUTIONS

Trial Pit Log

TrialPit No: TP-08
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555128.00 - 757063.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.60	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							TOPSOIL (grassland).
				0.25			Grey, firm, sandy, gravelly CLAY.
▼				0.52			Light brown, medium dense to dense, silghtly silty, very gravelly, fine to coarse SAND, with many cobbles and boulders. Cobbles and boulders are rounded to subrounded.
				2.00			Grey, silghtly sandy GRAVEL with cobbles and boulders. Cobbles and boulders are angular to subangular (possible weathered bedrock).
				2.60			End of Pit at 2.60m

1 2 3 4 5

Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No
TP-09
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555577.00 - 756741.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.80	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			TOPSOIL (grassland)
							Greyish brown, firm, slightly gravelly, sandy CLAY with some cobbles. Cobbles are subrounded to subangular.
▼				0.80			Brownish grey high plasticity sandy gravelly silty CLAY.
				2.10			Light grey, slightly clayey, slightly silty, sandy GRAVEL with cobbles and boulders (possible weathered bedrock).
				2.80			End of Pit at 2.80m

1 2 3 4 5

Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No
TP-11
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554390.00 - 755804.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.90	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Brown peaty TOPSOIL with rootlets.
				0.38			Brown/grey firm sandy gravelly CLAY with cobbles and boulders. Cobbles and boulders are subangular to subrounded.
				1.12			Dark grey/blue, soft, high plasticity, slightly sandy, gravelly CLAY.
				2.90			End of Pit at 2.90m

1
2
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Remarks:

Stability:

AGS

GDG GAVIN & DOHERTY GEOSOLUTIONS

Trial Pit Log

TrialPit No: TPr-01
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554655.00 - 758787.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.80	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			TOPSOIL (grassland)
							Brown, firm, sandy, gravelly CLAY with cobbles. Cobbles are subrounded to subangular.
				0.70			Light grey, medium dense to dense, silty, sandy GRAVEL with large cobbles and boulders. Boulders and cobbles are angular to subrounded.
▼				2.80			End of Pit at 2.80m

1
2
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Remarks:

Stability:

AGS

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Trial Pit Log

TrialPit No
TPr-02
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555041.00 - 757922.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.25	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			TOPSOIL (grassland)
				1.10			Brown firm to stiff sandy gravelly CLAY with some cobbles.
				2.25			Grey medium dense, sandy, silty GRAVEL with many cobbles. Cobbles are angular to subangular.
							End of Pit at 2.25m

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Remarks:

Stability:

AGS

GDG GAVIN & DOHERTY GEOSOLUTIONS

Trial Pit Log

TrialPit No: TPr-03
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555291.00 - 757482.00 Level:	Date 26/02/2020
Location: Clonbern, Co. Galway		Dimensions (m): Depth 2.10	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)			Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.23			Dark brown TOPSOIL with rootlets.
				0.90			Dark grey medium dense sandy gravelly SILT with cobbles and boulders.
				2.10			Grey brown, very soft, low strength, sandy, gravelly CLAY with cobbles and boulders.
							End of Pit at 2.10m

1 2 3 4 5

Remarks:

Stability:

AGS

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GEOSOLUTIONS

Trial Pit Log

TrialPit No
TPr-05
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 555342.00 - 756895.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 3.05	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
▼							Dark brown fibrous PEAT with rootlets.
				1.40			Grey stiff high strength CLAY.
				3.05			End of Pit at 3.05m

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Remarks:

Stability:

AGS

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GEOSOLUTIONS

Trial Pit Log

TrialPit No
TPr-06
Sheet 1 of 1

Project Name: Clonbern Windfarm	Project No. 20021	Co-ords: 554613.00 - 759000.00 Level:	Date 27/02/2020
Location: Clonbern, Co. Galway		Dimensions (m):	Scale 1:25
Client: McCarthy Keville O'Sullivan Ltd. (MKO)		Depth 2.80	Logged

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			TOPSOIL (grassland)
							Brown to light brown sandy gravelly CLAY with cobbles and some boulders. Cobbles are subrounded to subangular.
				2.80			End of Pit at 2.80m

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2
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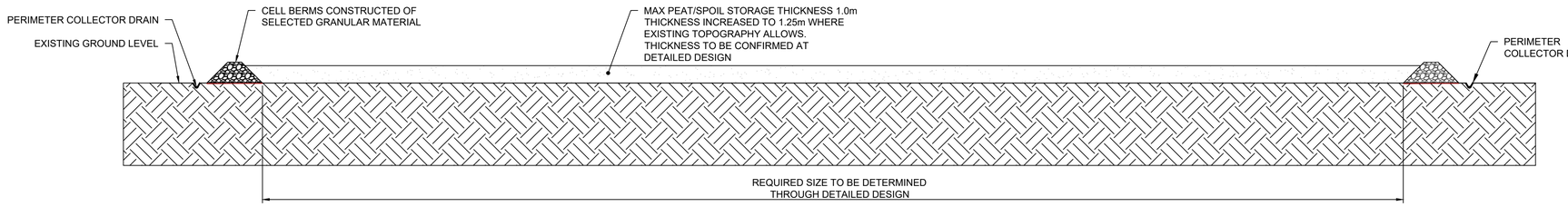
4
5

Remarks:

Stability:

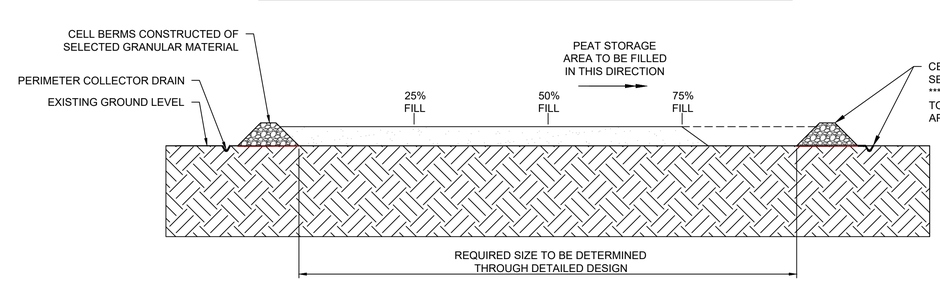
AGS

Appendix B PEAT AND SPOIL REPOSITORY DETAILS



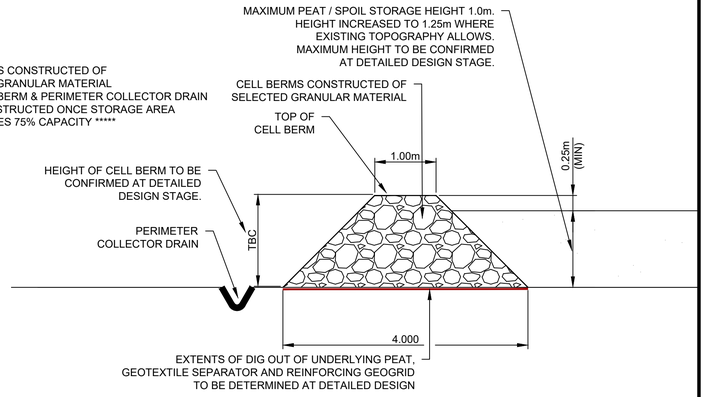
PEAT / SPOIL STORAGE - TYPICAL SECTION A-A

SCALE 1:200



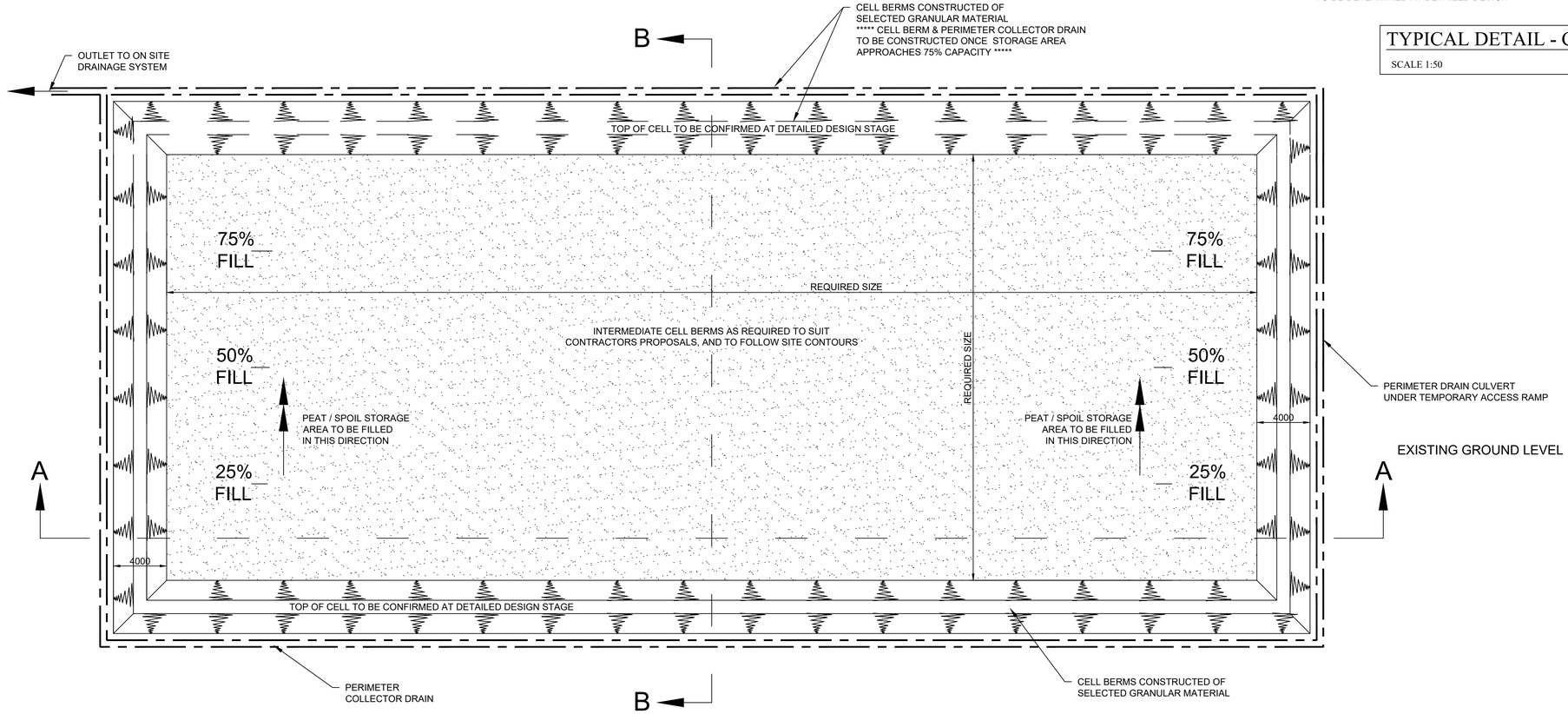
PEAT / SPOIL STORAGE - TYPICAL SECTION B-B

SCALE 1:200



TYPICAL DETAIL - CELL BERM

SCALE 1:50



PEAT / SPOIL STORAGE - TYPICAL PLAN

SCALE 1:200

NOTES:

1. THIS DRAWING IS FOR PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT PURPOSES AND SHOULD NOT BE USED AS DETAILED DESIGN OR FOR CONSTRUCTION.
2. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL PLACED MATERIAL WILL BE ALLOWED TO REVEGETATE NATURALLY FROM THE EXTENSIVE SEED SOURCE OF THE PLANTS THAT HAVE ALREADY COLONISED IN THE AREA. ALTERNATIVELY AND POSSIBLY IN ADDITION, SEEDING OF THE PLACED SPOIL COULD BE CARRIED OUT WHICH WOULD AID IN STABILISING THE PLACED SPOIL IN THE LONG TERM.
5. WHERE POSSIBLE, THE ACROTELM SHALL BE STORED WITH THE VEGETATION PART OF THE SOD FACING THE RIGHT WAY UP TO ENCOURAGE GROWTH OF PLANTS AND VEGETATION AT THE SURFACE OF THE STORED PEAT WITHIN THE PEAT STORAGE AREAS.
6. BOG MATS TO BE USED WHERE NECESSARY TO FACILITATE PLANT & MACHINERY ACCESS OVER SOFT GROUND.

REV:	S2-P01	DATE:	11/07/22	DRAWN BY:	EFC	CHECKED BY:	CE
DESCRIPTION:	ISSUED FOR INFORMATION						

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ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

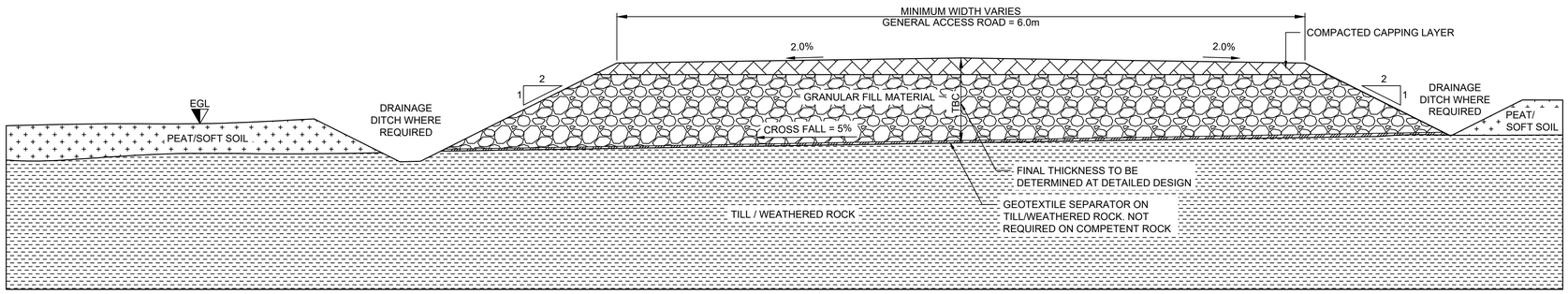
DRAWING No: 20021-GDG-ZZ-XX-DR-C-2000

Revision: -S2-P01

DRAWING TITLE: PEAT AND SPOIL STORAGE AREA TYPICAL DETAILS

SCALE:	SHOWN	SHEET SIZE:	A1	DATE:	11/07/2023
DRAWN BY:	EFC	CHECKED BY:	C.E.	APPROVED BY:	J.O'D

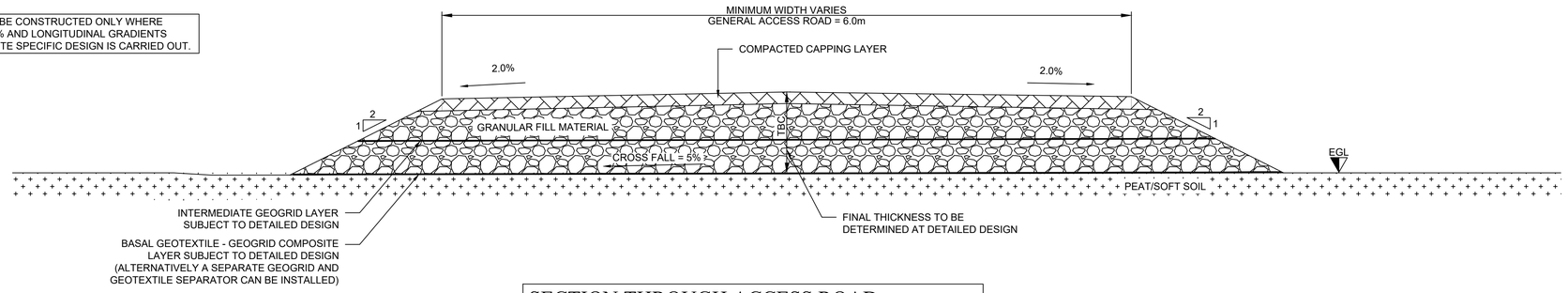
Appendix C ROAD CONSTRUCTION DETAILS



SECTION THROUGH ACCESS ROAD NEW CONSTRUCTION: FOUNDED - DETAIL 01

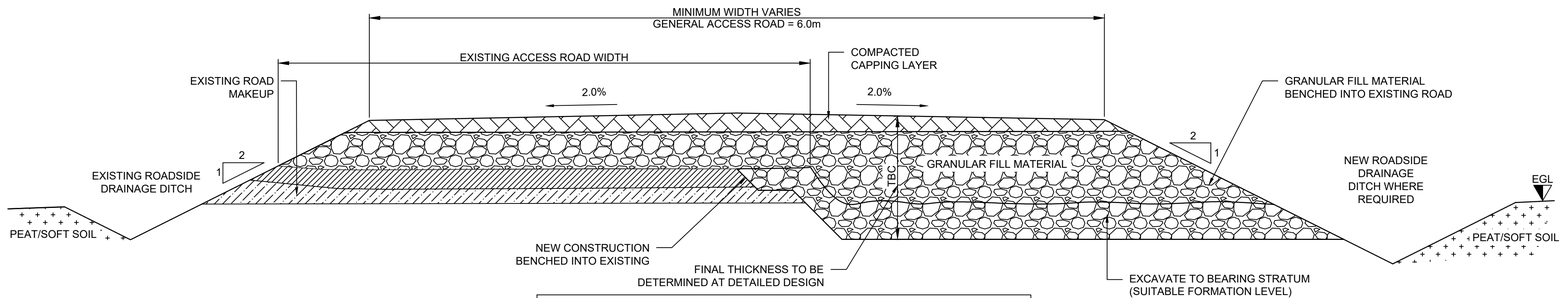
SCALE: N.T.S.

FLOATING ROADS TO BE CONSTRUCTED ONLY WHERE CROSSFALLS ARE <5% AND LONGITUDINAL GRADIENTS ARE <5% UNLESS A SITE SPECIFIC DESIGN IS CARRIED OUT.



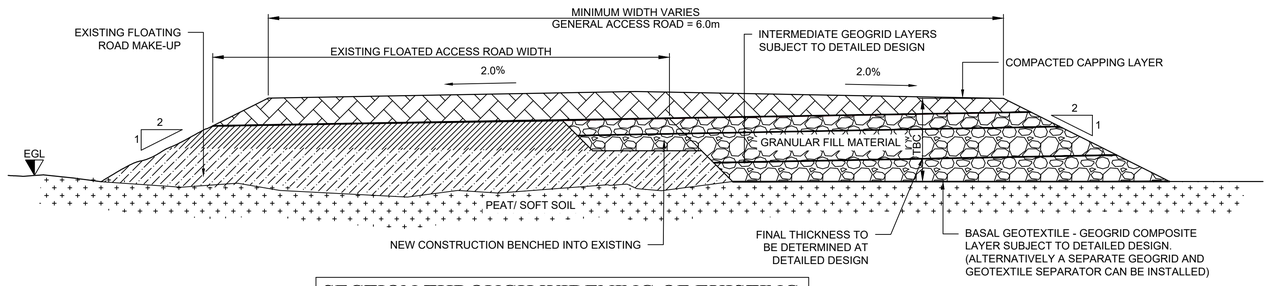
SECTION THROUGH ACCESS ROAD NEW CONSTRUCTION: FLOATED - DETAIL 02

SCALE: N.T.S.



SECTION THROUGH WIDENING OF EXISTING ACCESS ROAD: FOUNDED - DETAIL 03

SCALE: N.T.S.



SECTION THROUGH WIDENING OF EXISTING ACCESS ROAD: FLOATED - DETAIL 04

SCALE: N.T.S.

NOTES:

1. THIS DRAWING IS FOR PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT PURPOSES AND SHOULD NOT BE USED AS DETAILED DESIGN OR FOR CONSTRUCTION.
2. DO NOT SCALE FROM DRAWINGS.
3. THE STRENGTH OF THE SUBFORMATION SOILS TO BE ASSESSED BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION / PLACEMENT OF FILL.
4. DRAINAGE TO BE PROVIDED TO PREVENT WATER DEGRADATION OF THE SUBFORMATION SOILS IN-LINE WITH DRAINAGE STRATEGY.

HEALTH & SAFETY:

1. NO OPERATIVES TO ACCESS ANY UNSUPPORTED TRENCHES. TRENCHES TO BE ADEQUATELY BATTERED BACK OR SUPPORTED WHERE NECESSARY. SAFE TEMPORARY BATTER ANGLES TO BE ASSESSED IN ACCORDANCE WITH CIRIA REPORT 97 "TRENCHING PRACTICE".

REV:	S2-P01	DATE:	18/12/23	DRAWN BY:	EFC	CHECKED BY:	C.E.
DESCRIPTION:	ISSUED FOR INFORMATION						

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ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

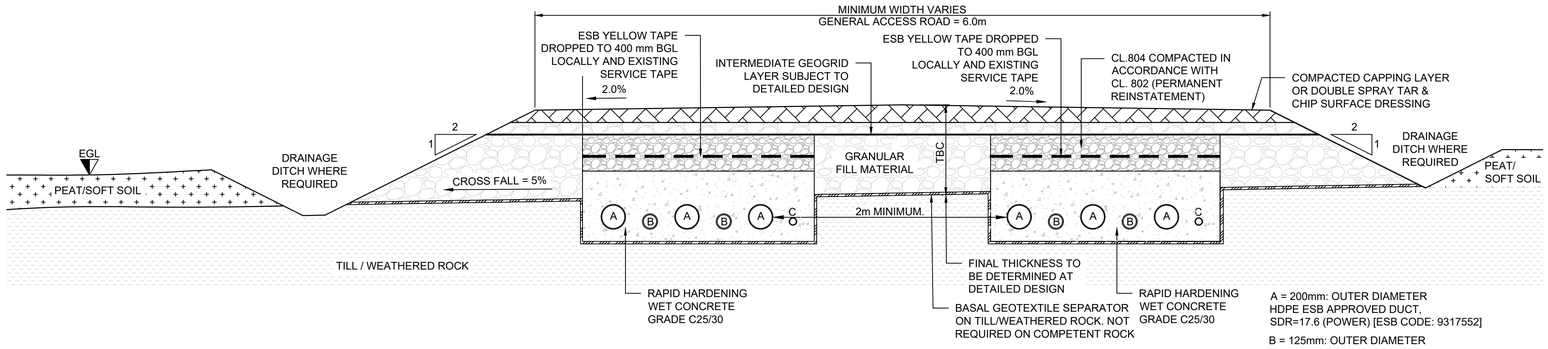
DRAWING No: 20021-GDG-ZZ-XX-DR-C-0100

Revision: -S2-P01

DRAWING TITLE: ACCESS ROAD STANDARD DETAILS

SCALE:	N.T.S.	SHEET SIZE:	A1	DATE:	18/12/2023
DRAWN BY:	EFC	CHECKED BY:	C.E.	APPROVED BY:	J.O'D.

Appendix D CABLE TRENCH DETAILS



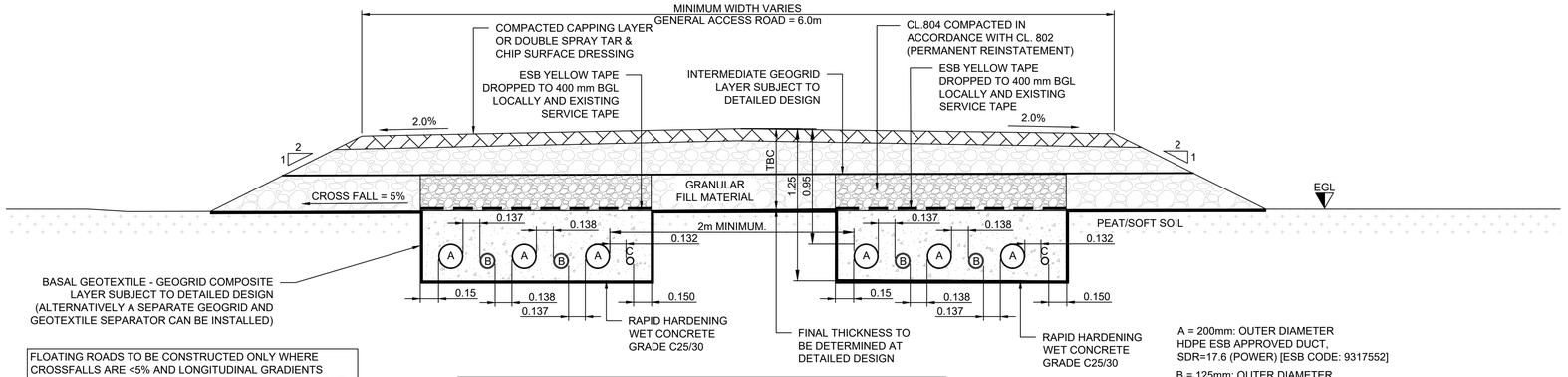
A = 200mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (POWER) [ESB CODE: 9317552]

B = 125mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (COMMS) [ESB CODE: 9317552]

C = 63mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (ECC) [ESB CODE: 9317552]

SECTION THROUGH CABLE TRENCH
NEW CONSTRUCTION: FOUNDED - DETAIL 01

SCALE: N.T.S.



FLOATING ROADS TO BE CONSTRUCTED ONLY WHERE CROSSFALLS ARE <5% AND LONGITUDINAL GRADIENTS ARE <5% UNLESS A SITE SPECIFIC DESIGN IS CARRIED OUT.

A = 200mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (POWER) [ESB CODE: 9317552]

B = 125mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (COMMS) [ESB CODE: 9317552]

C = 63mm: OUTER DIAMETER
HDPE ESB APPROVED DUCT,
SDR=17.6 (ECC) [ESB CODE: 9317552]

SECTION THROUGH CABLE TRENCH
NEW CONSTRUCTION: FLOATED - DETAIL 02

SCALE: N.T.S.

NOTES:

1. THIS DRAWING IS FOR PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT PURPOSES AND SHOULD NOT BE USED AS DETAILED DESIGN OR FOR CONSTRUCTION.
2. DO NOT SCALE FROM DRAWINGS.
3. THE STRENGTH OF THE SUBFORMATION SOILS TO BE ASSESSED BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION / PLACEMENT OF FILL.
4. DRAINAGE TO BE PROVIDED TO PREVENT WATER DEGRADATION OF THE SUBFORMATION SOILS IN-LINE WITH DRAINAGE STRATEGY.
5. BURIED CABLE SPACING TO BE DETERMINED DURING DETAILED DESIGN
6. DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED

HEALTH & SAFETY:

1. NO OPERATIVES TO ACCESS ANY UNSUPPORTED TRENCHES. TRENCHES TO BE ADEQUATELY BATTERED BACK OR SUPPORTED WHERE NECESSARY. SAFE TEMPORARY BATTER ANGLES TO BE ASSESSED IN ACCORDANCE WITH CIRIA REPORT 97 "TRENCHING PRACTICE".

REV:	S2-P02	DATE:	23/02/24	DRAWN BY: RR	CHECKED BY: C.E
DESCRIPTION:	UPDATE TO ADDRESS MKO COMMENTS				
REV:	S2-P01	DATE:	21/12/23	DRAWN BY: EFC	CHECKED BY: C.E.
DESCRIPTION:	ISSUED FOR INFORMATION				

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ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

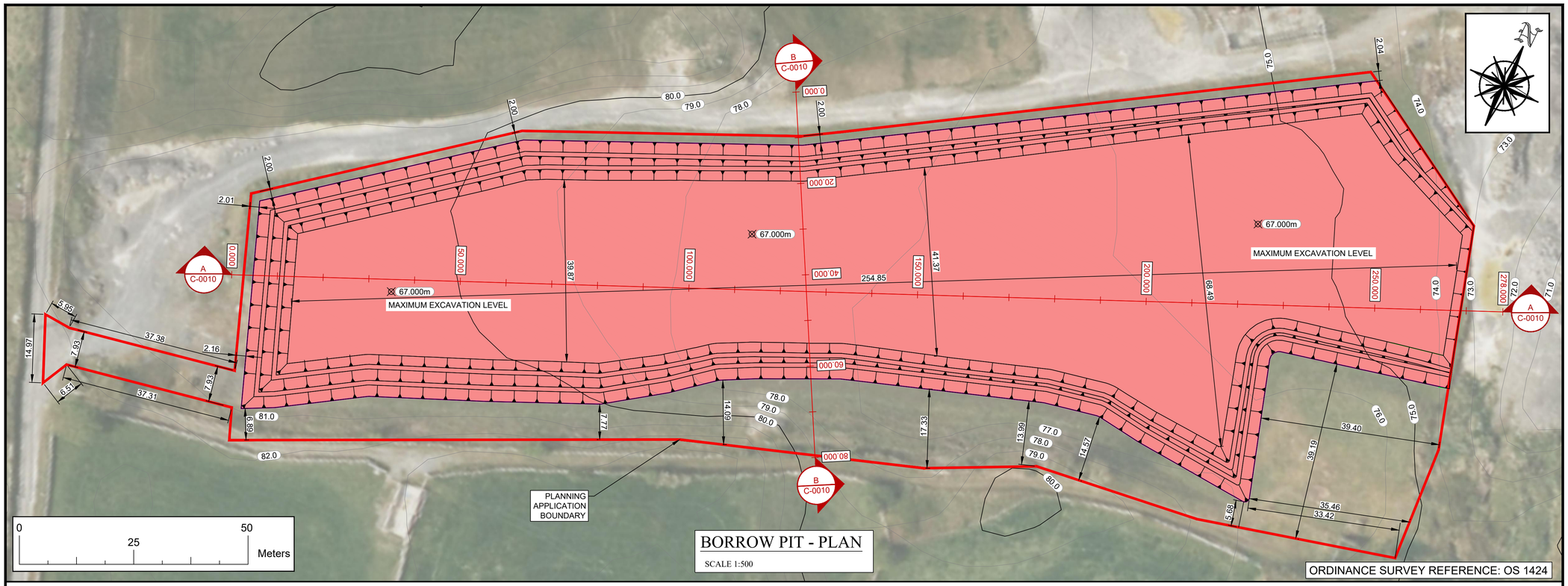
DRAWING No: 20021-GDG-ZZ-XX-DR-C-0101

Revision: -S2-P02

DRAWING TITLE: CABLE TRENCH STANDARD DETAILS

SCALE:	N.T.S.	SHEET SIZE:	A1	DATE:	21/12/2023
DRAWN BY:	EFC	CHECKED BY:	C.E.	APPROVED BY:	J.O'D.

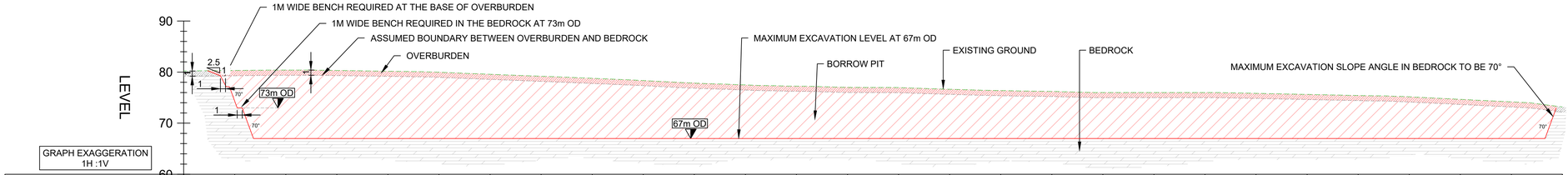
Appendix E BORROW PIT DETAILS



BORROW PIT - PLAN

SCALE 1:500

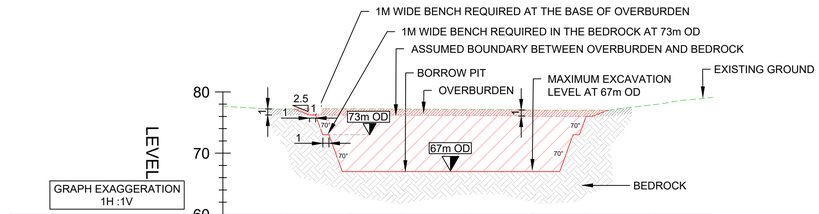
ORDINANCE SURVEY REFERENCE: OS 1424



CHAINAGE (m)	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000	220.000	230.000	240.000	250.000	260.000	270.000
EXISTING LEVELS (mOD)	80.233	80.329	80.395	80.324	80.177	79.978	79.577	79.196	78.788	78.348	77.848	77.496	77.261	77.000	76.977	76.648	76.387	76.220	76.000	76.000	76.000	75.847	75.635	75.424	75.169	74.668	74.178	73.174

SECTION A-A

SCALE 1:500



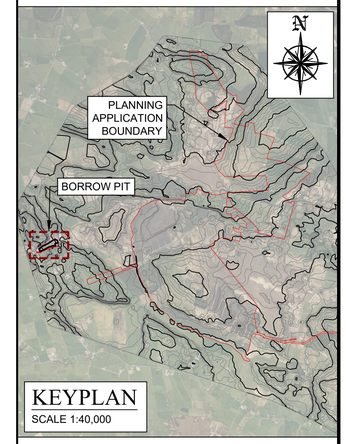
CHAINAGE (m)	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000
EXISTING LEVELS (mOD)	77.687	77.181	77.243	77.196	77.149	77.019	77.000	77.882	79.076

SECTION B-B

SCALE 1:500

NOTES:

1. THIS DRAWING IS FOR PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT PURPOSES AND SHOULD NOT BE USED AS DETAILED DESIGN OR FOR CONSTRUCTION DRAWINGS.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. THE OUTLINE AND SECTIONS ARE INDICATIVE AND ARE SUBJECT TO DETAILED DESIGN, SLOPE STABILITY ASSESSMENT AND ADDITIONAL GROUND INVESTIGATION.
4. IN-SITU ROCK SLOPE SHALL BE FORMED AT STABLE INCLINATIONS TO SUIT LOCAL ROCK CONDITIONS AND SUBJECT TO DETAILED DESIGN.
5. THE EXCAVATABILITY OF THE ROCK AND DEPTH TO TOP OF ROCK WITHIN EACH OF THE BORROW AREAS WILL NEED TO BE DETERMINED FROM A GROUND INVESTIGATION.
6. BORROW PIT 3D MODEL BASED ON TOPOGRAPHICAL SURVEY: 1m CONTOURS, RECEIVED 02.10.2023.
7. BORROW PIT EXTENTS TAKEN FROM MKO SHAPE FILE BP 2023.09.21, RECEIVED 21.09.2023. BORROW PIT EXTENT HAS BEEN MODIFIED BY GDG TO REFLECT OFFSETS FROM EXISTING SLOPES.



KEYPLAN

SCALE 1:40,000

LEGEND:

- BEDROCK (IN-SITU)
- BEDROCK (EXCAVATED)
- OVERBURDEN (IN-SITU)
- OVERBURDEN (EXCAVATED)

REV:	DATE:	DRAWN BY:	CHECKED BY:
S2-P02	14/03/24	E.F.C.	C.E.
DESCRIPTION:	OS NOTE ADDED		
REV: S2-P01	DATE: 12/03/24	DRAWN BY: E.F.C.	CHECKED BY: C.E.
DESCRIPTION:	BORROW PIT BOUNDARY AND REVISION NUMEBERING UPDATED		
REV: FI -02	DATE: 23/02/24	DRAWN BY: R.R.	CHECKED BY: C.E
DESCRIPTION:	UPDATE TO REFLECT UPDATED EIAR BOUNDARY		
REV: FI -01	DATE: 27/11/23	DRAWN BY: K.H	CHECKED BY: C.E
DESCRIPTION:	REVISED BORROW PIT MODELLING		
REV: FI -00	DATE: 11/02/22	DRAWN BY: K.H	CHECKED BY: A.A
DESCRIPTION:	ISSUED FOR INFORMATION		

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www.gdgeo.com

ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

DRAWING No: 20021-GDG-ZZ-XX-DR-C-0010

Revision: -S2-P02

DRAWING TITLE: BORROW PIT PLAN & SECTIONS

SCALE:	SHEET SIZE:	DATE:
1:500	A1	11/02/2022
DRAWN BY: K.H	CHECKED BY: A.A	APPROVED BY: J.O'D

Global Project Reach

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Phone: +353 1 207 1000

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