APPENDIX 8-1

GEOTECHNICAL AND PEAT STABILITY REPORT

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

GEOTECHNICAL & PEAT STABILITY REPORT

BALLIVOR WIND FARM

Prepared for: **MKO Ltd**

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GEOTECHNICAL & PEAT STABILITY ASSESSMENT REPORT
BALLIVOR WIND FARM

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Abstract: Fehily Timoney and Company (FT) were engaged by McCarthy Keville O'Sullivan to undertake a geotechnical assessment of the proposed Ballivor wind farm site with respect to peat stability. As part of the geotechnical assessment of the proposed development, FT completed a walkover survey at the site as well as a ground investigation comprising boreholes and trial pits. The findings of the geotechnical and peat stability assessment showed that the site has an acceptable margin of safety and is suitable for the proposed wind farm development.

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1. NON-TECHNCIAL SUMMARY

Fehily Timoney and Company (FT) was engaged by McCarthy Keville O'Sullivan on behalf of Coillte to undertake a geotechnical and peat stability assessment of the proposed Ballivor wind farm site. In accordance with planning guidelines compiled by the Department of the Housing, Planning and Local Government (Draft Revised Wind Energy Development Guidelines, DoHPLG, 2019), where peat >0.5m in thickness is present on a proposed wind farm development, a peat stability assessment is required.

A walkover including intrusive peat depth probing, desk study, stability analysis and risk assessment was carried out to assess the susceptibility of the site to peat failure following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, Scottish Government, 2017).

The findings, which involved analysis of approximately 300 locations, show that the site has an acceptable margin of safety and is suitable for the proposed wind farm project. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

The proposed wind farm comprises 26 no. wind turbines and associated infrastructure.

The site which is typically flat consists predominantly of bare locally re-vegetated cut-away peat and intact peat. The site has been extensively harvested and drained by Bord na Móna.

The site is relatively flat-lying with drainage channels running typically northwest to southeast. The site is split into three areas, with two areas to the north of the R156 regional road and one to the south. The land uses and types within the proposed development site are a mixture of bare cutover and cutaway peat, re-vegetation of bare peat and commercial Bord na Móna operated bog land. Several Bord na Mona rail lines also pass through the site.

Bord na Móna has considerable experience in the handling of peat in these circumstances, both during peat production operations and during wind farm construction projects. This experience has shown that the most environmentally sensitive and stable way of handling and moving of peat is its placement across the site and at locations as close as possible to the excavation areas.

A walkover including intrusive peat depth probing, a ground investigation including boreholes and trial pits, desk study, stability analysis and risk assessment was carried out to assess the susceptibility of the site to peat failure following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, 2nd Edition, 2017).

Peat depth recorded during the site walkover and from the ground investigation ranged from 0.4 to 4.9m with an average peat depth of 1.7m. 40% of the probes recorded peat depths of less than 1.5m, with 67% of peat depth probes recorded peat depths of less than 2.0m and 94% of peat depth probes recorded peat depths of less than 3.0m. A number of localised readings recorded peat depths from 3.0 to 4.9m.

Slope inclinations at the main infrastructure locations range from 2 to 4 degrees. The flat topography/nature of the terrain on site reflects the low risk of peat failure. Ground conditions comprised mainly of peat overlying lacustrine clay overlying fluvioglacial sands and gravel.

The purpose of the stability analysis was to determine the stability i.e. Factor of Safety (FoS), of the peat slopes. The FoS provides a direct measure of the degree of stability of a peat slope. A FoS of less than 1.0 indicates that

a slope is unstable; a FoS of greater than 1.0 indicates a stable slope. An acceptable FoS for slopes is generally taken as a minimum of 1.3. The stability analysis for this project, which analysed the turbine locations, access roads and substation, resulted in FoS above the minimum acceptable value of 1.3 and hence the site has a satisfactory margin of safety.

The risk assessment uses the results of the stability analysis in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability, to assess the risk of peat failure at the site. The results of the risk assessment are given in Appendix B. A construction buffer zone plan based on qualitative factors identified during the site walkover is included as Figure 4.2.

The findings of the peat assessment (which combines the FOS and the risk assessment), which involved analysis of 300 no. locations, showed that the proposed development areas have an acceptable margin of safety and that the site is suitable for the proposed wind farm development. Notwithstanding the above, the management of peat stability and appropriate construction practices will be inherent in the construction phase of the wind farm to ensure peat failures do not occur on site.

In summary, the Ballivor wind farm site has an acceptable margin of safety and is considered to be at **low** risk of peat failure.

2. INTRODUCTION

2.1 Fehily Timoney and Company

Fehily Timoney and Company (FT) is an Irish engineering, environmental science and planning consultancy with offices in Cork, Dublin and Carlow. The practice was established in 1990 and currently has about 70 members of staff, including engineers, scientists, planners and technical support staff. FT deliver projects in Ireland and internationally in our core competency areas of Waste Management, Environment and Energy, Civils Infrastructure, Planning and GIS and Data Management.

FT have been involved in over 100 wind farm developments in both Ireland and the UK at various stages of development i.e. preliminary feasibility, planning, design, construction and operational stage and have established themselves as one of the leading engineering consultancies in peat stability assessment, geohazard mapping in peat land areas, investigation of peat failures and site assessment of peat.

This Report was writen by Ian Higgins (FT Principal Geotechnical Engineer, MSc in Geotechnical Engineering) and Alan Whelan (FT Project Engineer, BEng (Hons) Civil Engineering). Ian is a Principal Geotechnical Engineer with Fehily Timoney and has over 20 years' experience in geotechnical engineering. Alan is a Project Engineer with Fehily Timoney and has two years' experience in geotechnical engineering.

2.2 Project Description

FT was engaged in February 2020 by McCarthy Keville O'Sullivan (MKO) to undertake a geotechnical & peat stability assessment of the proposed Ballivor wind farm site.

The proposed Ballivor wind farm is located approximately 4km west of Ballivor, on the border between Co. Meath and Co. Westmeath.

The Ballivor wind farm site comprises milled peat area of approximately 19.6km^2. The site is located on the border between Co. Meath and Co. Westmeath. The surrounding landscape is predominately flat with land-use comprising forestry, agricultural land and cutaway peatland.

The development comprises the following:

(1) 26 no. wind turbines and all associated hard-standing areas

(2) 2 no. borrow pits

(3) 1 no. 110kV electrical substation, which will be constructed in the townland of Grange More

(4) Provision of new site access roads and associated drainage

(5) All works associated with the connection of the proposed wind farm to the national electricity grid

(6) 2 no permanent meteorological masts with a height of 115m

(7) New access junctions, improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads and construction access

(8) All associated site development works

The peat depth data was recorded by FT during the site walkovers from the 8th to the 10th June 2021 and the 22nd to the 24th June 2021 and has been used in the assessment of peat stability for the proposed wind farm site.

Ground investigation in the form of trial pits and boreholes were carried out by FT and Irish Drilling Ltd. (IDL) during the following dates:

- 17th - 21st August 2020
- 1st - 16th February 2021
- 19th July 2021
- 5th - 11th August 2021

In addition to the above, Bord na Mona undertook trial pitting on the 18th and 19th of March 2021.

2.3 Peat Stability Assessment Methodology

FT undertook the assessment following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (2nd edition, PLHRAG, Scottish Government, 2017). The Peat Landslide Hazard and Risk Assessment Guide (PLHRAG) is used in this report as it provides best practice methods to identify, mitigate and manage peat slide hazards and associated risks in respect of consent applications for electricity generation projects.

The best practice guide was produced following peat failures in the Shetland Islands, Scotland in September 2003 but more pertinently following the peat failure in October 2003, during the construction of a wind farm at Derrybrien, County Galway, Ireland.

This peat stability assessment has been undertaken taking into account peat failures that have occurred on peatland sites (such as recent failures at Shass Mountain 2020, Co. Leitrim and Meenbog 2020, Co. Donegal). The lessons learned from both peat slide events have been incorporated into the design of this project and the construction methodologies to be implemented. The Meenbog failure occurred during the construction of a section of floating road on sidelong ground in an area of weak peat. The slope angle on the Proposed Development site are lower than those at Meenbog, and no significant areas of sidelong ground are present. It is important that the existing site drainage is maintained during construction to avoid a similar failure to that on Shass Mountain, which occurred following heavy rainfall, and this is referenced in the Risk Assessments.

A constraints study was initially undertaken by the Environmental, Hydrogeological and Ecological members of the design team to determine the developable area on the site, prior to the site reconnaissance by engineering geologists/geotechnical engineers from FT. The extent and depth of ground investigation and peat stability analysis by FT have been undertaken in accordance with guidance within Eurocode 7 and PLHRAG, 2017 to investigate peat slopes that have the potential to impact on the proposed development, as applicable. Sufficient peat depth data has been recorded during the site walkovers to enable the characterisation of the peat depth across the site, with additional detail at infrastructure locations. The peat stability assessment is undertaken within the proposed development to identify peat slope at risk from the proposed development, and to identify peat slopes that may pose a risk to the proposed development.

The geotechnical and peat stability assessment at the site included the following activities:

(1) Desk study

(2) Site reconnaissance including shear strength and peat depth measurements undertaken following initial constraints study (by design team) to determine the proposed construction envelope within the site

(3) Peat stability assessment of the peat slopes on site using a deterministic and qualitative approach

(4) Peat contour depth plan – compiled based on the peat depth probes carried out across the site by FT (2020)

(5) Factor of safety plan – compiled for the short-term critical condition (undrained) for approximately 300 no. FoS points analysed along the proposed infrastructure envelope on site

(6) Construction buffer zone plan – identifies areas with an elevated or higher construction risk where mitigation/control measures will need to be implemented during construction to minimise the potential risks and ensure they are kept within an acceptable range

(7) A peat stability risk register was compiled to assess the potential design/construction risks at the infrastructure locations and determine adequate mitigation/control measures for each location to minimise the potential risks and ensure they are kept within an acceptable range, where necessary

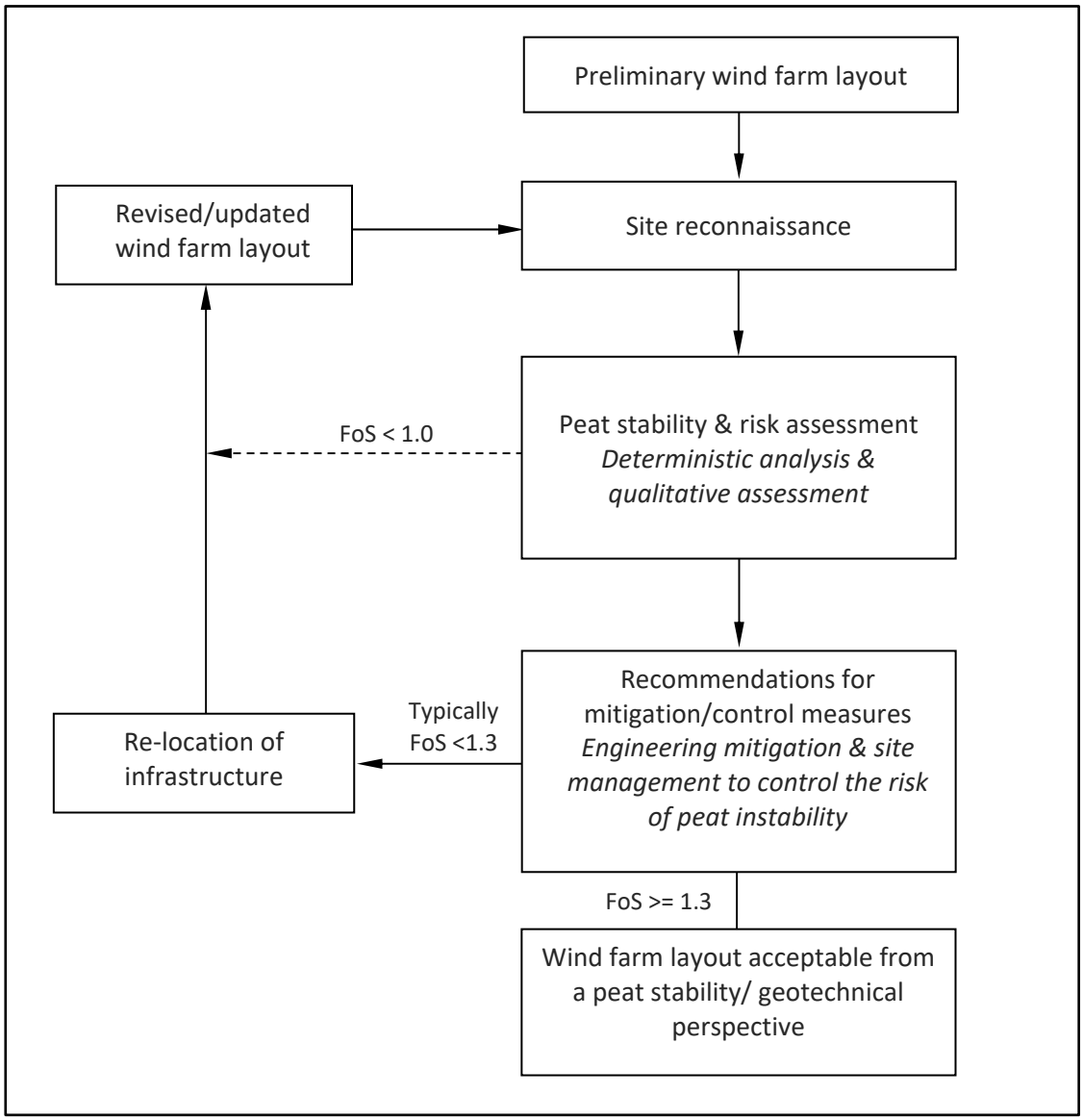
(8) Review of ground investigation carried out at the site

(9) Preliminary assessment of foundation type for turbines

(10) Commentary of founding details for other infrastructure elements such as access roads, crane hardstands, substation & construction compound platforms and met mast foundation

A flow diagram showing the general methodology for peat stability assessment is shown in Figure 2.1. The methodology illustrates the optimisation of the wind farm layout based on the findings from the site reconnaissance and stability analysis and subsequent feedback.

Figure 2.1: Methodology for Peat Stability Assessment



*An FoS of between 1.0 and 1.3 does not mean that a failure will occur, but that the area requires attention. Mitigation measures can be provided for areas with an FoS of between 1.0 and 1.3 to reduce the risk of failure.

As for all construction projects, a detailed engineering construction design must be carried out by the appointed construction stage designer prior to any construction work commencing on site. This must take account of the consented project details and any conditions imposed by that consent. This must include a confirmatory peat stability assessment to account for any changes in the environment which may have occurred in the time leading up to the commencement of construction and a peat and spoil management plan to allow for the most appropriate geotechnical and environmental led solutions to be developed for the management of peat and spoil

2.4 Peat Failure Definition

Peat failure in this report refers to a significant mass movement of a body of peat that would have an adverse impact on the proposed wind farm development and the surrounding environment. Peat failure excludes localised movement of peat that would occur below an access road, creep movement or erosion type events.

The potential for peat failure at this site is examined with respect to wind farm construction and associated activity.

2.5 Main Approaches to Assessing Peat Stability

The main approaches for assessing peat stability for wind farm developments include the following:

(1) Geomorphological

(2) Qualitative (judgement)

(3) Index/Probabilistic (probability)

(4) Deterministic (factor of safety)

Approaches (1) to (3) listed above are considered subjective and do not provide a definitive indication of stability; in addition, a high level of judgement/experience is required which makes it difficult to relate the findings to real conditions. FT apply a more objective approach, the deterministic approach (as discussed in Section 2.6).

As part of FT's deterministic approach, a qualitative risk assessment is also carried out taking into account qualitative factors, which cannot necessarily be quantified, such as the presence of mechanically cut peat, quaking peat, bog pools, sub peat water flow, slope characteristics and numerous other factors. The qualitative factors used in the risk assessment are compiled based on FT's experience of assessments and construction in peat land sites and peat failures throughout Ireland and the UK. FT have been involved with in excess of 100 wind farm developments across Ireland and the UK at various stages of development, from preliminary feasibility stage through planning and from scheme development at tender design and detailed design stage, through to the construction and operational stages. This approach follows the guidelines for geotechnical risk management as given in Clayton (2001), as referenced in the best practice for Peat Landslide Hazard and Risk Assessment Guide (PLHRAG, 2017), and takes into account the approach of MacCulloch (2005).

The risk assessment uses the results of the deterministic approach in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability to assess the risk of instability on a peat land site.

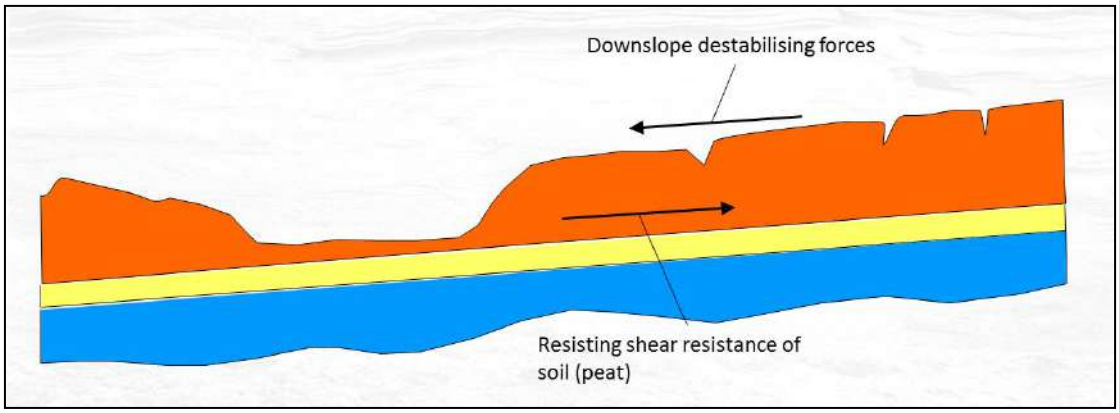
2.6 Peat Stability Assessment – Deterministic Approach

The peat stability assessment is carried out across a wide area of peatland to determine the stability of peat slopes and to identify areas of peatland that are suitable for development; this allows the layout of infrastructure on a particular wind farm site to be optimised. The assessment provides a numerical value (factor of safety) of the stability of individual parcels of peatland. The findings of the assessment discriminate between areas of stable and unstable peat, and areas of marginal stability where restrictions may apply. This allows for the identification of the most suitable locations for turbines, access roads and other infrastructure associated with wind energy developments.

A deterministic assessment requires geotechnical information and site characteristics which are obtained from desk study and site walkover, e.g. properties of peat/soil/rock, slope geometry, depth of peat, underlying strata, groundwater, etc. An adverse combination of the factors listed above could potentially result in instability. Using the information above, a factor of safety is calculated for the stability of individual parcels of peatland on a site (as discussed in Section 7).

The factor of safety is a measure of the stability of a particular slope. For any slope, the degree of stability depends on the balance of forces between the weight of the soil/peat working downslope (destabilising force) and the inherent strength of the peat/soil (shear resistance) to resist the downslope weight, see Figure 2.2.

Figure 2.2: Peat Slope Showing Balance of Forces to Maintain Stability



The factor of safety provides a direct measure of the degree of stability of a slope and is the ratio of the shear resistance over the downslope destabilising force. Provided the available shear resistance is greater than the downslope destabilising force then the factor of safety will be greater than 1.0 and the slope will remain stable. If the factor of safety is less than 1.0 the slope is unstable and liable to fail. The acceptable range for factor of safety is typically from 1.3 to 1.4 (BS5930:1981). For the purposes of this assessment a result of >1.3 is required.

2.7 Applicability of the Factor of Safety (Deterministic) Approach for Peat Slopes

The factor of safety approach is a standard engineering approach in assessing slopes which is applied to many engineering materials, such as peat, soil, rock, etc.

The factor of safety approach is included in the Peat Landslide Hazard and Risk Assessments Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, 2017); see Section 5.3.1 of the guide. This guide provides best practice methods to identify, mitigate and manage peat slide hazards and associated risks in respect of consent applications for electricity generation projects.

Furthermore, the best practice guide notes that the results from the factor of safety approach 'has provided the most informative results' with respect to analysing peat stability (Section 5.3.1 of the guide).

The factor of safety approach in this report includes undrained (short-term stability) and drained (long-term stability) analyses. The undrained condition is the critical condition for the development. The purpose of the drained analysis is to identify the relative susceptibility of rainfall-induced failures at the site.

Notwithstanding the above, the stability analysis used by FT in this report also includes qualitative factors to determine the potential for peat stability i.e. the analysis used does not solely rely on the factor of safety approach.

The deterministic analysis is considered an acceptable engineering design approach. This concurs with the best practice guide referenced above.

2.8 Assessment of Intense Rainfall and Extreme Dry Events on the Peat Slope

The deterministic approach carried out by FT examines intense rainfall and extreme dry events. The deterministic approach includes and undrained (short-term stability) and drained (long-term stability) analysis to assess the factor of safety for the peat slopes against a peat failure.

The drained loading condition applies in the long-term. This condition examines the effect of the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes. For the drained analysis the level of the water table above the failure surface is required to calculate the factor of safety for the peat slope.

In order to represent varying water levels within the peat slopes, a sensitivity analysis is carried out which assesses varying water level in the peat slopes i.e. water levels ranging from 0 to 100% of the peat depth is conducted, where 0% equates to the peat been completely dry and 100% equates to the peat being fully saturated.

By carrying out such a sensitivity analysis with varying water level in the peat slopes, the effects of intense rainfall and extreme dry events are considered and analysed. The results of which are presented in Section 7 of this report.

3. DESK STUDY

3.1 Desk Study

The main relevant sources of interest with respect to the site include:

- Geological plans and Geological Survey of Ireland database
- Ordnance survey plans
- Literature review of peat failures

The Geological Survey of Ireland (GSI, 1999) geological plans for the site were used to verify the soil and bedrock conditions.

The Ordnance Survey plans were reviewed to determine if any notable features or areas of particular interest (from a geotechnical point of view) are present on the site.

The desk study also includes a review of both published literature and GSI online dataset viewer (GSI, 2021) on peat failures/landslides in the vicinity of the site.

3.2 Soils, Subsoil & Bedrock

A review of the Geological Survey of Ireland online database and published documents from GSI was carried out.

The GSI subsoils maps indicates that the site is underlain by a combination of predominantly cut over raised peat with small pockets of till derived from limestones and gravels derived from limestone.

In relation to bedrock, the site location and surrounding area is underlain by the Walsortian Limestone Formation. This formation comprises a massive, unbedded lime-mudstone. The north-western corner of the site is underlain by the Lucan Formation, a dark limestone and shale and the Tober Colleen Formation, a calcareous route.

There is a quarry recorded approximately 9km southeast of the site boundary.

No karst features were identified on the survey area. The nearest karst feature was recorded 3km to the west of the site and is described as a spring.

No geological heritage sites are noted within 5km of the site development.

3.3 Previous Failures

There are no recorded peat failures within the Ballivor wind farm site (GSI, 2020). The nearest recorded failure is located at Girley Bog, approximately 12km north of the study area. This failure described as a block slide failure. It is not known when the failure occurred.

The landslide susceptibility the site was classified by the GSI (2020) as low susceptibility, which is expected given the flat terrain present.

The presence, or otherwise, of relict peat failures or clustering of relict failures within an area is an indicator that particular site conditions exist that pre-dispose a site to failure or not as the case may be. Hence based on the historical data reviewed and the terrain and ground conditions present on site it can be concluded that site conditions in the area of the Ballivor site have a limited potential of peat failure.

4. FINDINGS OF SITE RECONNAISSANCE

4.1 Site Reconnaissance

As part of the assessment of potential peat failure at the proposed site, FT carried out a site reconnaissance in conjunction with the desk study review described in Section 3. This comprised walkover inspections of the site with recording of salient geomorphological features with respect to the wind farm development which included peat depth and preliminary assessment of peat strength. General photographs of the site are included at the end of the main text. The information gathered from these site visits provide sufficient information for a site-wide assessment of the extent, depth and strength of peat present at the Proposed Development.

The following salient geomorphological features were considered:

- Active, incipient or relict instability (where present) within the peat deposits
- Presence of shallow valley or drainage line
- Wet areas
- Any change in vegetation
- Peat depth
- Slope inclination and break in slope

The method adopted for carrying out the site reconnaissance relied on experienced practitioners carrying out a visual assessment of the site supplemented with measurement of slope inclinations.

4.2 Findings of Site Reconnaissance

The site reconnaissance comprised a walkover inspection of the site from the 8th to the 10th and the 22nd to the 24th June 2021. Weather conditions for the site visit were sunny, warm and dry.

The findings from the site walkover have been used to optimise the layout of the infrastructure on site.

The main findings of the site walkover of the wind farm site are as follows:

(1) The site is typically covered in a layer of peat and relatively flat. Peat depths vary across the site depending on mainly topography. Generally deeper peat was encountered in the flatter areas of the site with thinner peat on the few areas of higher ground. Bare cutover and cutaway peat, re-vegetation of bare peat and commercial Bord na Móna operated bog land are present across the site (see Appendix A). Several Bord na Mona rail lines also pass through the site.

(2) A total of approximately 300 no. peat depth probes were carried out on site. Peat depths recorded from peat probing across the site ranged from 0.4 to 4.9m with an average depth of 1.7m (Figure 4-1). Approximately 94 percent of peat depth probes recorded peat depths of less than 3.0m. A number of localised readings were recorded where peat depths were 3.0 to 4.9m.

(3) The peat depths recorded at the turbine locations varied from 0.85 to 4.9m with an average depth of 2.6m.

(4) With respect to the new proposed access roads, peat depths are typically less than 3.0m with localised depths of up to 4.2m recorded.

(5) The access roads for the wind farm upgrade comprise of existing access roads and the construction of new proposed access roads. The construction of new proposed access roads will be carried out using either a floating or an excavate & replace construction technique which involves the removal and replacement of peat or soft ground where encountered.

(6) Slope angles at the turbine locations ranged from 2 to 4 degrees. These slope angle readings were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment, such as the Silva Clino Master which has an accuracy of +/- 0.25 degrees and from contour survey plans for the site.

(7) The slope angle quoted typically reflects the slope within the footprint of each infrastructure location. The flat topography/nature of the terrain on site highlights the low risk of peat failure.

(8) Localised areas of ponded water were recorded. This is not unexpected given the ground conditions and the flat terrain present across the site.

(9) No evidence of past failures or any significant signs of peat instability were noted on site.

(10) A summary of the site walkover findings for the wind farm are as follows:

(a) The site is typically covered in a layer of peat with typically flat terrain and open peatland. Peat depths recorded across the site ranged from 0.4 to 4.9m with an average depth of 1.7m.

(b) A construction buffer zone plan has been produced for the site (Figure 4-2). This shows areas on the site where no development is advised and areas with an elevated or higher construction risk. The above identified buffer areas are based on qualitative factors identified during the walkover survey e.g. relatively deep peat, quaking peat, mechanically cut peat, recent peat landslide, etc.

(c) The results of the peat depth probing, shear strength testing of the peat and qualitative factors identified on site have been used in the stability and risk assessments, see Sections 6, 7 and 8 of this report for details.

(d) Based on the findings from the walkover survey, the proposed wind farm development is considered to have a low risk of peat failure.

In summary, based on the findings from the site reconnaissance, the proposed development footprint for the site would be considered to have a low risk of peat instability.

PLAN

Scale 1:20000

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Peat Depth Legend:

- ≥ 0 < 0.5
- ≥ 0.5 < 1
- ≥ 1 < 1.5
- ≥ 1.5 < 2
- ≥ 2 < 2.5
- ≥ 2.5 < 3
- ≥ 3 < 3.5
- ≥ 3.5 < 4
- ≥ 4 < 4.5
- > 4.5

T22 T23 T24 T25 T26 T21 T20 T19 J08 J07 T15 T14 T16 J03 T18 J04 J02 T13 J05 T17 J06 MM2 J01

Proposed Turbine & Hardstanding

Proposed New Access Road

Proposed Permanent Amenity Car Park

Proposed Temporary Construction Compound

Site Boundary

Proposed Met Mast 2

Proposed Temporary Access Track

Borrow Pit 2

Proposed Site Offices

Access for delivery and Removal of Machinery to Borrow Pit

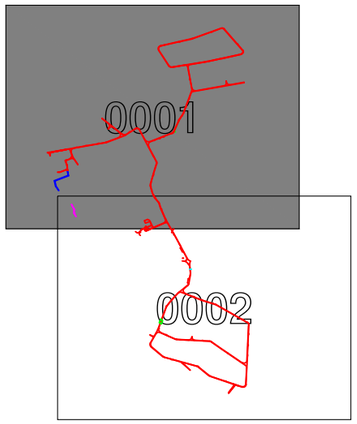
Proposed Substation

Corduff - Mullingar 110kv OHL

Borrow Pit 1B

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:20000



KEYPLAN

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FIGURE 4.1 - PEAT DEPTH CONTOURS SHEET 1 OF 2

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Friday 24 February 2023

PLAN

Scale 1:20000

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Peat Depth Legend:

- ≥ 0 < 0.5
- ≥ 0.5 < 1
- ≥ 1 < 1.5
- ≥ 1.5 < 2
- ≥ 2 < 2.5
- ≥ 2.5 < 3
- ≥ 3 < 3.5
- ≥ 3.5 < 4
- ≥ 4 < 4.5
- > 4.5

Access for delivery and Removal of Machinery to Borrow Pit
Proposed Substation
Corduff - Mullingar 110kv OHL
Borrow Pit 1B
J01
ENT01
ENT02
Proposed Drain
Borrow Pit 1A
Proposed Site Offices
J09
T12
T01
T02
Site Boundary
Proposed Met Mast 1
T11
J13
J12
MM1
T06
T03
Proposed Turbine & Hardstanding
T05
T04
Proposed New Access Road
T10
J11
T09
T08
J10
T07

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

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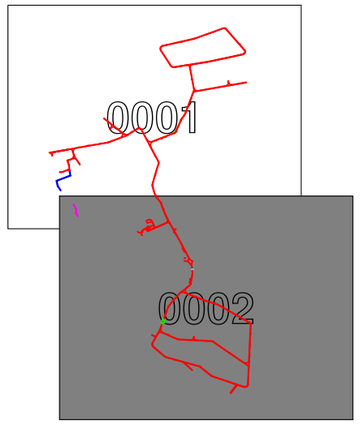

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FIGURE 4.1 - PEAT DEPTH CONTOURS SHEET 2 OF 2

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PLAN

Scale 1:20000

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Construction Buffer Zone Legend:

- Watercourses / Lakes with 50m buffer
- Drains with 10m buffer

T22 T23 T24 T25 T26 T21 T20 T19 T15 T14 T16 T18 T13 T17

J08 J07 J03 J02 J04 J05 J06 J01

MM2

Proposed Turbine & Hardstanding

Proposed New Access Road

Proposed Permanent Amenity Car Park

Proposed Temporary Construction Compound

Site Boundary

Proposed Met Mast 2

Proposed Temporary Access Track

Borrow Pit 2

Proposed Site Offices

Access for delivery and Removal of Machinery to Borrow Pit

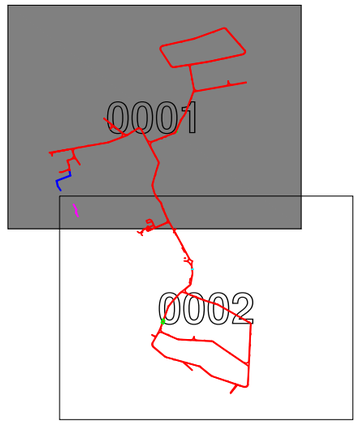
Proposed Substation

Corduff - Mullingar 110kv OHL

Borrow Pit 1B

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:20000



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Date - 24.02.23

FIGURE 4.2 - CONSTRUCTION BUFFER ZONE PLAN SHEET 1 OF 2

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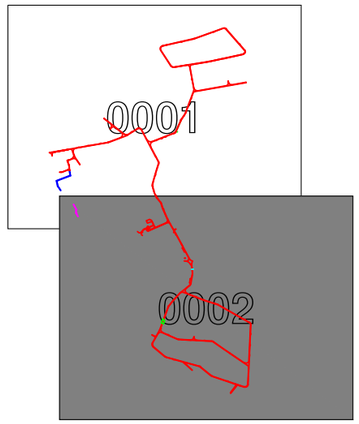
PLAN
Scale 1:20000

Access for delivery and Removal of Machinery to Borrow Pit
Proposed Substation
Corduff - Mullingar 110kv OHL
Borrow Pit 1B
J01
ENT01
ENT02
Proposed Drain
Borrow Pit 1A
Proposed Site Offices
J09
T12
T01
T02
Site Boundary
Proposed Met Mast 1
T11
J13
J12
MM1
T06
T05
T04
T03
Proposed Turbine & Hardstanding
Proposed New Access Road
T10
J11
T09
T08
J10
T07

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m
Scale 1:20000

Construction Buffer Zone Legend:

- Watercourses / Lakes with 50m buffer
- Drains with 10m buffer



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Date - 24.02.23

FIGURE 4.2 - CONSTRUCTION BUFFER ZONE PLAN SHEET 2 OF 2

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5. GROUND INVESTIGATION

Ground investigations in the form of trial pits and boreholes were carried out at the Ballivor site by FT and Irish Drilling Limited (IDL) in August 2020 and February, July and August 2021.

The ground investigations by FT and IDL comprised a total of 78 no. trial pits, 16 no. boreholes and 5 no. rotary coreholes with associated laboratory testing. An additional 24 trial pits were excavated by Bord na Mona. The ground investigations were carried out using a phased approach. The initial phase of ground investigation was to investigate the potential to develop borrow pits across the site. With the second phase of investigations were carried out at the main infrastructure locations on site e.g. turbine and substation locations. The third phase of investigations involved investigation at an additional two borrow pit locations.

The laboratory testing included the following:

- Classification testing for overburden material
- Minimum and maximum density values for overburden material
- Determination of dry density/moisture content relationship

The trial pits logs, photographs and associated laboratory testing are included within Appendix E and F of this report.

The purpose of the ground investigation was to assess the ground conditions at the main infrastructure locations and potential borrow pit locations across the site. A ground investigation location plan is included as Figure 5-1 in this report.

5.1 Summary of Ground Conditions

The ground conditions at the site can be typically categorised into the following deposits:

Peat – Typically described as orangish brown to dark brown amorphous to fibrous peat. Peat thicknesses from ranged from 1.1 to >4.5m from trial pits and 0.4 to 3.8m from the boreholes.

Lacustrine Clay – Light grey to brown, soft to stiff slightly gravelly organic Silt/Clay with some cobbles. The thickness of the layer is variable across the site.

Fluvioglacial Sand and Gravel – Typically described as grey silty sandy Gravel/silty fine Sand with cobbles and some boulders. The thickness of the layer is variable across the site.

Glacial Till – Typically described as soft to stiff greenish grey to blueish grey slightly sandy slightly gravelly Silt/Clay. The thickness of the layer is variable across the site.

Groundwater was recorded in thirty-two of the trial pits and boreholes on site and varied between 0.0 and 7.4m bgl.

5.2 Summary of Laboratory Tests

Following completion of intrusive site investigations by FT and IDL laboratory testing was scheduled by FT and undertaken by Irish Drilling Ltd (IDL). Soil testing was carried out in accordance with BS1377 (1990) - *Methods of Test for Soils for Civil Engineering Purposes* in IDL's Materials Laboratory, accredited in accordance with the Irish National Accreditation Board (INAB).

The samples of the overburden material were analysed for a range of parameters which included Particle Size Distribution (PSD), Moisture Content and Atterberg Limits.

The results are summarised in Table 5.1. Further detail is included in the FT Ground Investigation Report.

Table 5.1: Laboratory Testing

Type	N	Min	Max	Remarks
Natural Moisture Content (%)	49	5.2	55	Typical % lower from gravel dominated soil and higher for silt dominated soil. Outlier at BPA-BH01 with 43% for Gravel.
Atterberg Limits	26	0	27	Low plasticity Clay and intermediate-to-high plasticity silt.
Particle Size Distribution	47	-	-	% passing 63 µm ranged from 4 to 72%
Hydrometer	8	-	-	% passing 1.6 µm ranged from 4 to 14%
Compaction	3			OMC of 11-12% recorded
Moisture Condition Value (MCV)	3	8.8	10.5	
Soil Organic Content (%)	12	0.421-	17.4	
Sulphate Total (mg/kg)	13	<48	473	
Water Soluble Sulphate as SO_4 (g/L)	13	<0.004	0.0435	
Total Sulphur (%)	6	<0.02	0.36	
pH	13	6.4	8.69	

5.3 Summary of Geotechnical Parameters

Table 5-2 contains characteristic geotechnical parameters for the main material types likely to be encountered on the Ballivor wind farm site. Where direct measurement of parameters has not been carried out, established correlations with measured properties have been used to derive values. Characteristic values are defined as a cautious estimate of the value affecting the occurrence of limit state based on clause 2.4.5.2 from Eurocode 7.

Table 5-2: Summary of Geotechnical Parameters

Material Type/Strata	Unit Weight	Geotechnical Parameters		
		Undrained Parameters	Drained Parameters	
	γ (kN/m³)	c_u (kPa)	φ' (°)	c' (kPa)
Peat	11	8 (3)	25	4
Lacustrine Soil	18	20	26	0
Fluvioglacial – Sand & Gravel	20	-	32	0
Glacial Till	19	75	30	0

Notes

Note (1) The above parameters are indicative only and have been derived based on experience and from a review of the ground investigation carried out at the site.

Note (2) Where direct measurement of parameters has not been carried out, established correlations with measured properties have been used to derive values.

Note (3) A lower bound undrained shear strength, c_u for the peat of 8kPa was selected. The lowest recorded value on the Ballivor wind farm site was 18kPa hence a value of 8kPa is a conservative value

Note (4) φ' (°) – internal angle of shearing resistance

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Legend:

- BPA-TP01 Location of Trial Pit
- BPA-BH01 Location of Borehole
- CMP-W05 Location of Rotary Corehole

0m 125m 250m 375m 500m 625m 750m 875m 1000m 1125m 1250m

Scale 1:25000

PLAN

Scale 1:25000

PLAN

Scale 1:5000

Scale (@ A3) 1:25000

Date - 24.02.23

FIGURE 5.1 - GROUND INVESTIGATION LOCATION PLAN

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6. PEAT DEPTHS, STRENGTH & SLOPE AT PROPOSED INFRASTRUCTURE LOCATIONS

As part of the site walkover, peat depth, in-situ peat strength and slope angles were recorded at various locations across the site.

6.1 Peat Depth

Peat depth probes were carried out at/near to proposed turbine locations and access roads and other main infrastructure elements. At turbine locations up to 5 probes were carried out around the turbine location, and an average peat depth was calculated.

6.2 Peat Strength

The strength testing was carried out in-situ using a Geonor H-60 Hand-Field Vane Tester. From FT's experience hand vanes give indicative results for in-situ strength of peat and would be considered best practice for the field assessment of peat strength. Strength testing was carried out at selected locations across the site to provide representative coverage of indicative peat strengths. The results of the vane testing with depth are presented in Figure 6.1.

6.3 Slope Angle

The slope angles at each of the main infrastructure locations were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment, such as the Silva Clino Master and from contour survey plans for site.

The slope angle quoted typically reflects the slope within the footprint of each infrastructure location. It should be noted that slope angles derived from contour survey plans would be considered approximate, as such surveys are dependent on the density of survey data and do not always reflect local variations in ground topography. Slope angles recorded during the site reconnaissance by FT using handheld equipment would generally be deemed more accurate and representative of local topography.

6.4 Summary of Findings

Based on the peat depths recorded across the site by FT, the peat varied in depth from 0.4 to 4.9m with an average depth of 1.7m. All peat depth probes carried out on site have been utilised to produce a peat depth contour plan for the site (Figure 4.1).

A summary of the peat depths at the proposed infrastructure locations is given in Table 6.1. The data presented in Table 6.1 is used in the peat stability assessment of the site.

Table 6.1: Peat Depth & Slope Angle at Proposed Infrastructure Locations

Turbine	Easting	Northing	Peat Depth Range (m) (1)	Average Peat Depth (m)	Slope Angle (°) (2)
T01	665162	753511	1.1 – 2.35	1.5	2
T02	665604	753275	1.0 – 1.75	1.1	3
T03	665983	752965	0.4 – 0.85	0.5	2
T04	665796	752196	2.5 – 2.9	2.8	3
T05	665231	752587	2.1 – >4.9	2.2	2
T06	664502	752692	1.0 – 2.1	1.1	3
T07	665928	751694	3.6 – 4.4	3.9	4
T08	665164	751792	0.7 – 3.8	1.5	2
T09	664623	752007	1.5 – 2.9	1.6	2
T10	663783	752452	0.7 – 2.05	0.8	2
T11	663976	753121	1.0 – 1.2	1.1	3
T12	664329	753719	2.1 – >3.5	2.2	2
T13	663739	757007	1.7 – 2.8	1.8	2
T14	663474	757496	0.4 – 1.2	0.5	3
T15	662595	757805	2.1 – 2.8	2.6	3
T16	662765	757323	2.5 – >4.1	3.0	2
T17	662002	756804	0.6 – 1.0	0.8	4
T18	661508	757054	2.2 – 4.4	2.4	4
T19	665118	758520	2.0 – 2.8	2.2	4
T20	665844	758647	1.6 – 2.0	1.8	2
T21	664274	759054	0.8 – 1.0	0.9	3
T22	664023	759553	1.2 – 1.6	1.4	2
T23	664744	759727	2.1 – 3.1	2.2	2
T24	665464	759850	1.4 – 3.35	1.8	3
T25	665735	759326	2.0 – 3.85	2.1	2
T26	665028	759172	1.7 – 2.3	1.9	2
Met Mast 1	661518	756595	2.5 – 3.0	2.75	2
Met Mast 2	663677	752816	1.5 – 2.0	1.65	2
Borrow Pit 1/1a (Carranstown)	664226	755100	0.0 - -2.1	1.2	0-2
Borrow Pit 2	661667	755996	0.7	-	4

Car Park 1	664349	757812	1.0 – 2.0	1.4	3
Substation	663587	755382	1.0 – 1.9	1.5	2
Construction Compound 1	663854	757488	1.8 – 2.0	1.9	3
Construction Compound 2	663517	755194	0.5 – 1.9	1.1	2
Construction Compound 3	664542	754056	1.2 – 1.8	1.45	2
Construction Compound 4	661791	756641	0.9 – 2.0	1.35	3
Construction Compound 5	665323	751430	0.8 – 1.8	1.25	2

Note (1) Based on probe results from the site walkovers. The range of peat depths for the infrastructure locations are typically based on a 10m grid carried out around the infrastructure element, where accessible.

Note (2) The slope angles at each of the main infrastructure locations were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment, such as the Silva Clino Master (which has an accuracy of +/- 0.25 degrees) and from contour survey plans for site. The slope angle quoted typically reflects the slope within the footprint of each infrastructure location.

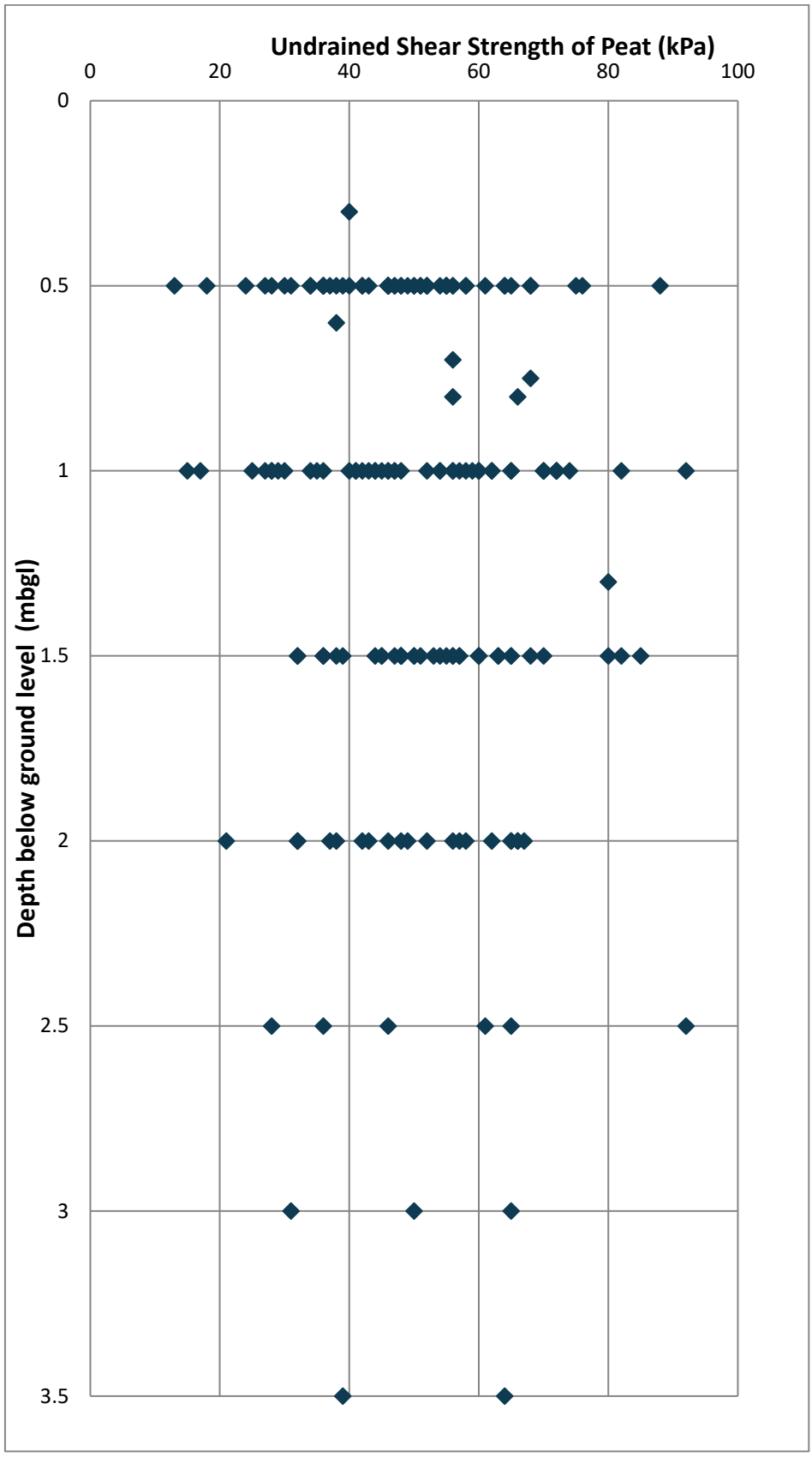
Note (3) The data presented in the Table above is used in the peat stability assessment of the site.

In addition to probing, in-situ shear vane testing was carried out as part of the ground investigation. Strength testing was carried out at selected locations across the site to provide representative coverage of indicative peat strengths. The results of the vane testing with depth are presented in Figure 6.1.

The hand vane results indicate undrained shear strengths in the range 13 to 130kPa, with an average value of about 50kPa. The strengths recorded would be typical of well drained peat as is present on the Ballivor site.

Peat strength at sites of known peat failures (assuming undrained loading failure) are generally very low, for example the undrained shear strength at the Derrybrien failure (AGEC, 2004) as derived from back-analysis, was estimated at 2.5kPa. The recorded undrained strength at Ballivor is significantly greater than the lower bound values for Derrybrien indicating that there is no close correlation to the peat conditions at the Derrybrien site and that there is significantly less likelihood of failure on the Ballivor site.

Figure 6.1: Undrained Shear Strength (c_u) Profile for Peat with Depth



7. PEAT STABILITY ASSESSMENTS

The peat stability assessment includes an assessment of the stability of the natural peat slopes for individual parcels across the site including at the turbine locations and along the proposed access roads. The assessment also analyses the stability of the natural peat slopes with a surcharge loading of 10kPa, equivalent to placing 1m of stockpiled peat on the surface of the peat slope.

7.1 Methodology for Peat Stability Assessment

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

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

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

1. The undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.

2. The drained loading condition applies in the long-term. The condition examines the effect of the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes.

Undrained shear strength values (c_u) for peat are used for the total stress analysis. Based on the findings of the 2003 Derrybrien failure and other failures in peat, undrained loading during construction was found to be the critical failure mechanism.

A drained analysis requires effective cohesion (c') and effective friction angle (ø') values for the calculations. These values can be difficult to obtain because of disturbance experienced when sampling peat and the difficulties in interpreting test results due to the excessive strain induced within the peat. To determine suitable drained strength values a review of published information on peat was carried out. Table 7.1 shows a summary of the published information on peat together with drained strength values.

From Table 7.1 the values for c' ranged from 1.1 to 8.74kPa and ø' ranged from 21.6 to 43°. The average c' and ø' values are 4.5kPa and 30° respectively. Based on the above, it was considered to adopt a conservative approach and to use design values below the averages. For design the following general drained strength values have been used for the site:

c' = 4kPa
$ø'$ = 25°

Table 7.1: List of Effective Cohesion and Friction Angle Values for Peat

Reference	Cohesion, c' (kPa)	Friction Angle, ø' (degs)	Testing Apparatus/ Comments
Hanrahan et al (1967)	5 to 7	36 to 43	From triaxial apparatus
Rowe and Mylleville (1996)	2.5	28	From simple shear apparatus
Landva (1980)	2 to 4	27.1 to 32.5	Mainly ring shear apparatus for normal stress greater than 13kPa
	5 to 6	-	At zero normal stress
Carling (1986)	6.5	0	-
Farrell and Hebib (1998)	0	38	From ring shear and shear box apparatus. Results are not considered representative.
	0.61	31	From direct simple shear (DSS) apparatus. Result considered too low therefore DSS not considered appropriate
Rowe, Maclean and Soderman (1984)	1.1	26	From simple shear apparatus
	3	27	From DSS apparatus
McGreever and Farrell (1988)	6	38	From triaxial apparatus using soil with 20% organic content
	6	31	From shear box apparatus using soil with 20% organic content
Hungr and Evans (1985)	3.3	-	Back-analysed from failure
Dykes and Kirk (2006)	3.2	30.4	Test within acrotelm
Dykes and Kirk (2006)	4	28.8	Test within catotelm
Warburton et al (2003)	5	23.9	Test in basal peat
Warburton et al (2003)	8.74	21.6	Test using fibrous peat
Hendry et al (2012)	0	31	Remoulded test specimen
Komatsu et al (2011)	8	34	Remoulded test specimen
Zwanenburg et al (2012)	2.3	32.3	From DSS apparatus
Den Haan & Grognet (2014)	-	37.4	From large DSS apparatus
O'Kelly & Zhang (2013)	0	28.9 to 30.3	Tests carried out on reconstituted, undisturbed and blended peat samples

7.2 Analysis to Determine Factor of Safety (Deterministic Approach)

The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes using infinite slope analysis. The analysis was carried out at the turbine locations, along the proposed access roads and at various locations across the site.

The FoS provides a direct measure of the degree of stability of the slope. A FoS of less than unity indicates that a slope is unstable, a FoS of greater than unity indicates a stable slope.

The acceptable safe range for FoS typically ranges from 1.3 to 1.4. The previous code of practice for earthworks BS 6031:1981 (BSI, 1981), provided advice on design of earthworks slopes. It stated that for a first-time failure with a good standard of site investigation the design FoS should be greater than 1.3.

As a general guide the FoS limits for peat slopes in this report are summarised in Table 7.2.

Table 7.2: Factor of Safety Limits for Slopes

Factor of Safety (FoS)	Degree of Stability
Less than 1.0	Unstable (red)
Between 1.0 and 1.3	Marginally stable (yellow)
1.3 or greater	Acceptable (green)

Eurocode 7 (EC7) (IS EN 1997-1:2005) now serves as the reference document and the basis for design geotechnical engineering works. The design philosophy used in EC7 applies partial factors to soil parameters, actions and resistances. Unlike the traditional approach, EC7 does not provide a direct measure of stability, since global Factors of Safety are not used.

As such, and in order to provide a direct measure of the level of safety on a site, EC7 partial factors have not been used in this stability assessment. The results are given in terms of FoS.

A lower bound undrained shear strength, c_u for the peat of 8kPa was selected for the assessment based on the c_u values recorded at the site. It should be noted that a c_u of 8kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality the peat generally has a higher undrained strength.

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

$$F = \frac{c_u}{\gamma z \sin\alpha \cos\alpha}$$

Where:

F = Factor of Safety
c_u = Undrained strength
γ = Bulk unit weight of material

z = Depth to failure plane assumed as depth of peat

α = Slope angle

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

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

Where:

F = Factor of Safety

c' = Effective cohesion

γ = Bulk unit weight of material

z = Depth to failure plane assumed as depth of peat

γ_w = Unit weight of water

h_w = Height of water table above failure plane

α = Slope angle

ϕ' = Effective friction angle

For the drained analysis the level of the water table above the failure surface is required to calculate the factor of safety for the slope. Since the water level in blanket peat can be variable and can be recharged by rainfall, it is not feasible to establish its precise location throughout the site. Therefore, a sensitivity analysis using water level ranging between 0% and 100% of the peat depth was conducted, where 0% equates to the peat being completely dry and 100% equates to the peat been fully saturated.

The following general assumptions were used in the analysis of peat slopes at each location:

(1) Peat depths are based on the maximum peat depth recorded at each location from the walkover surveys.

(2) The slope angles used in the peat stability assessment were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment and from contour survey plans for site. It should be noted that slope angles derived from contour survey plans would be considered approximate, as such surveys are dependent on the density of survey data and do not always reflect local variations in ground topography.

(3) Slope angle at base of sliding assumed to be parallel to ground surface.

(4) A lower bound undrained shear strength, c_u for the peat of 8kPa was selected for the assessment. The lowest recorded value on the Ballivor wind farm site during the site walkover was 13kPa. It should be noted that a c_u of 8kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality, the peat has a significantly higher undrained strength as a result of the extensive drainage & extraction works which have been carried out on site.

For the stability analysis two load conditions were examined, namely

Condition (1): no surcharge loading
Condition (2): surcharge of 10 kPa, equivalent to 1m of stockpiled peat assumed as a worst case.

7.3 Results of Analysis

7.3.1 Undrained Analysis for the Peat

The results of the undrained analysis for the natural peat slopes are presented in Appendix C and the results of the undrained analysis for the most critical load case (load condition 2) are shown on Figure 7.1. The undrained analysis for load condition 2 is considered the most critical load case as most peat failures occur in the short term upon loading of the peat surface. The results from the main infrastructure locations are summarised in Table 7.3.

The calculated FoS for load condition 1 is in excess of 1.30 for each of the locations (approx. 300 no. locations) analysed with a range of FoS of 2.61 to 57.34, indicating a low risk of peat instability.

The calculated FoS for load condition 2 is in excess of 1.30 for each of the locations (approx. 300 no. locations) analysed with a range of FoS of 2.13 to 16.38, indicating a low risk of peat instability.

Table 7.3: Factor of Safety Results (Undrained Condition)

Turbine No./Waypoint	Easting	Northing	Factor of Safety for Load Condition	
			Condition (1)	Condition (2)
T1	665162	753511	**9.76**	**6.85**
T2	665604	753275	**8.75**	**5.57**
T3	665983	752965	**26.98**	**12.40**
T4	665796	752196	**5.47**	**4.03**
T5	665231	752587	**4.68**	**3.89**
T6	664502	752692	**7.29**	**4.94**
T7	665928	751694	**2.61**	**2.13**
T8	665164	751792	**6.04**	**4.78**
T9	664623	752007	**7.91**	**5.88**
T10	663783	752452	**11.19**	**7.52**
T11	663976	753121	**13.92**	**7.29**
T12	664329	753719	**6.55**	**5.10**
T13	663739	757007	**8.19**	**6.04**
T14	663474	757496	**12.76**	**6.96**
T15	662595	757805	**5.89**	**4.25**
T16	662765	757323	**5.59**	**4.50**
T17	662002	756804	**12.77**	**6.05**
T18	661508	757054	**2.61**	**2.13**
T19	665118	758520	**4.11**	**3.03**

Turbine No./Waypoint	Easting	Northing	Factor of Safety for Load Condition	
			Condition (1)	Condition (2)
T20	665844	758647	**11.47**	**7.65**
T21	664274	759054	**17.01**	**8.06**
T22	664023	759553	**16.38**	**9.56**
T23	664744	759727	**7.40**	**5.59**
T24	665464	759850	**457**	**3.52**
T25	665735	759326	**5.96**	**4.73**
T26	665028	759172	**9.97**	**6.95**
Met Mast 1	661518	756595	**7.65**	**5.10**
Met Mast 2	663677	752816	**11.47**	**7.65**
Borrow Pit 1/1a (Carranstown)	664226	755100	**7.66**	**4.60**
Borrow Pit 2	661667	755996	**16.42**	**6.76**
Car Park 1	664349	757812	**7.65**	**5.10**
Substation	663587	755382	**12.07**	**7.91**
Construction Compound 1	663854	757488	**8.50**	**5.47**
Construction Compound 2	663517	755194	**12.07**	**7.91**
Construction Compound 3	664542	754056	**12.74**	**8.19**
Construction Compound 4	661791	756641	**11.47**	**7.65**
Construction Compound 5	665323	751430	**12.74**	**8.19**

PLAN

Scale 1:20000

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Factor of Safety Legend:

- 0 < 1.0
- ≥ 1.0 < 1.3
- ≥ 1.3

Increasing Stability

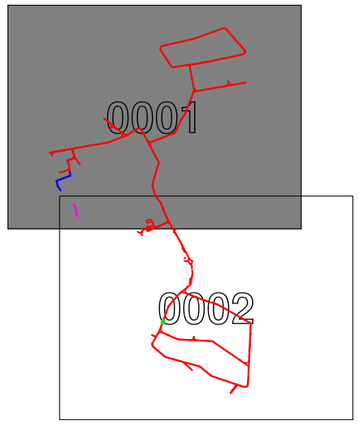
No Peat Recorded At This Location

T24
T23
T22
T25
J08
T26
T21
T20
T19
J07
T15
T14
T16
J03
J02
T18
J04
T13
J05
T17
J06
MM2

Proposed Turbine & Hardstanding
Proposed New Access Road
Proposed Permanent Amenity Car Park
Proposed Temporary Construction Compound
Site Boundary
Proposed Met Mast 2
Proposed Temporary Access Track
Borrow Pit 2
Proposed Site Offices
Access for delivery and Removal of Machinery to Borrow Pit
Proposed Substation
Corduff - Mullingar 110kv OHL
Borrow Pit 1B
J01

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:20000



KEYPLAN

Scale (@ A3) 1:20000

Date - 24.02.23

FIGURE 7.1 - FACTOR OF SAFETY PLAN SHEET 1 OF 2

Drawn - POR

Checked - IH

Rev - C

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Friday 24 February 2023

PLAN

Scale 1:20000

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Factor of Safety Legend:

- 0 < 1.0
- ≥ 1.0 < 1.3
- ≥ 1.3

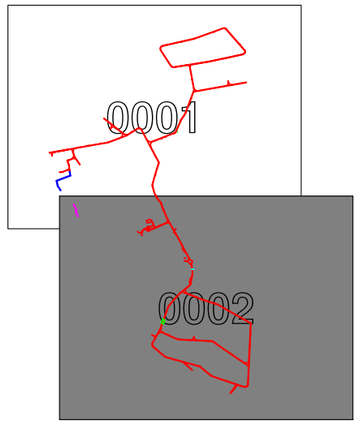
Increasing Stability

No Peat Recorded At This Location

Access for delivery and Removal of Machinery to Borrow Pit
Proposed Substation
Corduff - Mullingar 110kv OHL
Borrow Pit 1B
J01
ENT01
ENT02
Proposed Drain
Borrow Pit 1A
Proposed Site Offices
J09
T12
T01
T02
Site Boundary
Proposed Met Mast 1
T11
J13
J12
MM1
T06
T05
T03
Proposed Turbine & Hardstanding
T04
Proposed New Access Road
J10
T10
J11
T09
T08
T07

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:20000



KEYPLAN

Scale (@ A3) 1:20000

Date - 24.02.23

FIGURE 7.1 - FACTOR OF SAFETY PLAN SHEET 2 OF 2

Drawn - POR

Checked - IH

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7.3.2 Drained Analysis for the Peat

The results of the drained analysis for the peat are presented in Appendix C. The results from the main infrastructure locations are summarised in Table 7.4. As stated previously, the drained loading condition examines the effect of rainfall and water on the existing stability of the natural peat slopes.

The calculated FoS for load condition 1 is in excess of 1.30 for each of the locations (approx. 300 no. locations) analysed with a range of FoS of 1.31 to 28.67, indicating a low risk of peat instability.

The calculated FoS for load condition 2 is in excess of 1.30 for each of the locations (approx. 300 no. locations) analysed with a range of FoS of 2.30 to 17.73, indicating a low risk of peat instability.

The results of Condition (2) are slightly higher than for Condition (1) in the drained case because the water level is assumed to be at original ground level, rather than at the top of the additional 1m of peat. This results in a slightly higher FoS because the effective height of the water in the peat is no longer 100% of the height of the peat.

Table 7.4: Factor of Safety Results (Drained Conditions)

Turbine No./Waypoint	Easting	Northing	Factor of Safety for Load Condition	
			Condition (1)	Condition (2)
T1	665162	753511	**4.88**	**7.41**
T2	665604	753275	**4.37**	**6.02**
T3	665983	752965	**13.49**	**13.42**
T4	665796	752196	**2.73**	**4.36**
T5	665231	752587	**2.34**	**4.21**
T6	664502	752692	**3.64**	**5.34**
T7	665928	751694	**1.31**	**2.30**
T8	665164	751792	**3.02**	**5.17**
T9	664623	752007	**3.95**	**6.36**
T10	663783	752452	**5.59**	**8.14**
T11	663976	753121	**6.96**	**7.88**
T12	664329	753719	**3.28**	**5.52**
T13	663739	757007	**4.10**	**6.53**
T14	663474	757496	**6.38**	**7.52**
T15	662595	757805	**2.94**	**4.60**
T16	662765	757323	**2.80**	**4.87**
T17	662002	756804	**6.39**	**6.54**
T18	661508	757054	**1.31**	**2.30**
T19	665118	758520	**2.05**	**3.27**
T20	665844	758647	**5.73**	**8.27**

Turbine No./Waypoint	Easting	Northing	Factor of Safety for Load Condition	
			Condition (1)	Condition (2)
T21	664274	759054	**8.50**	**8.71**
T22	664023	759553	**8.19**	**10.34**
T23	664744	759727	**3.70**	**6.05**
T24	665464	759850	**2.28**	**3.80**
T25	665735	759326	**2.98**	**5.12**
T26	665028	759172	**4.99**	**7.52**
Met Mast 1	661518	756595	**3.82**	**6.21**
Met Mast 2	663677	752816	**5.73**	**8.27**
Borrow Pit 1/1a (Carranstown)	664226	755100	**3.83**	**4.97**
Borrow Pit 2	661667	755996	**8.21**	**7.30**
Car Park 1	664349	757812	**3.83**	**5.52**
Substation 1	663587	755382	**6.04**	**8.56**
Construction Compound 1	663854	757488	**4.25**	**5.91**
Construction Compound 2	663517	755194	**6.04**	**8.56**
Construction Compound 3	664542	754056	**6.37**	**8.86**
Construction Compound 4	661791	756641	**5.73**	**8.27**
Construction Compound 5	665323	751430	**6.37**	**8.86**

8. PEAT STABILITY RISK ASSESSMENT

A peat stability risk assessment was carried out for the main infrastructure elements at the wind farm. This approach takes into account guidelines for geotechnical/peat stability risk assessments as given in PLHRAG (2017) and MacCulloch (2005).

The risk assessment uses the results of the stability analysis (deterministic approach) in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability, to assess the risk for each infrastructure element.

For each of the main infrastructure elements, a risk rating (product of probability and impact) is calculated and rated as shown in Table 8.1. Where a subsection is rated 'Medium' or 'High', control measures are required to reduce the risk to at least a 'Low' risk rating. Where a subsection is rated 'Low' or 'Negligible', only routine control measures are required.

Table 8.1: Risk Rating Legend

17 to 25	High: avoid works in area or significant control measures required
11 to 16	Medium: notable control measures required
5 to 10	Low: only routine control measures required
1 to 4	Negligible: none or only routine control measures required

A full methodology for the peat stability risk assessment is given in Appendix D.

8.1 Summary of Risk Assessment Results

The results of the peat stability risk assessment for potential peat failure at the main infrastructure elements is presented as a Geotechnical Risk Register in Appendix B and summarised in Table 8.2.

The risk rating for each infrastructure element at the Ballivor wind farm is designated Negligible or Low following some mitigation/control measures being implemented. Sections of access roads to the nearest infrastructure element will be subject to the same mitigation/control measures that apply to the nearest infrastructure element.

Details of the required mitigation/control measures can be found in the Geotechnical Risk Register for each infrastructure element (Appendix B).

Table 8.2: Summary of Peat Stability Risk Register

Infrastructure	Pre-Control Measure Implementation Risk Rating	Pre-Control Measure Implementation Risk Rating Category	Notable Control Measures Required	Post-Control Measure Implementation Risk Rating	Post-Control Measure Implementation Risk Rating Category
T1	Negligible	1 to 4	No	Negligible	1 to 4
T2	Negligible	1 to 4	No	Negligible	1 to 4
T3	Negligible	1 to 4	No	Negligible	1 to 4
T4	Negligible	1 to 4	No	Negligible	1 to 4
T5	Negligible	1 to 4	No	Negligible	1 to 4
T6	Negligible	1 to 4	No	Negligible	1 to 4
T7	Negligible	1 to 4	No	Negligible	1 to 4
T8	Negligible	1 to 4	No	Negligible	1 to 4
T9	Negligible	1 to 4	No	Negligible	1 to 4
T10	Negligible	1 to 4	No	Negligible	1 to 4
T11	Negligible	1 to 4	No	Negligible	1 to 4
T12	Negligible	1 to 4	No	Negligible	1 to 4
T13	Low	5 to 10	No	Low	5 to 10
T14	Low	5 to 10	No	Low	5 to 10
T15	Negligible	1 to 4	No	Negligible	1 to 4
T16	Negligible	1 to 4	No	Negligible	1 to 4
T17	Negligible	1 to 4	No	Negligible	1 to 4
T18	Negligible	1 to 4	No	Negligible	1 to 4
T19	Low	5 to 10	No	Low	5 to 10
T20	Negligible	1 to 4	No	Negligible	1 to 4
T21	Low	5 to 10	No	Low	5 to 10
T22	Negligible	1 to 4	No	Negligible	1 to 4
T23	Negligible	1 to 4	No	Negligible	1 to 4
T24	Negligible	1 to 4	No	Negligible	1 to 4
T25	Negligible	1 to 4	No	Negligible	1 to 4
T26	Negligible	1 to 4	No	Negligible	1 to 4
Met Mast 1	Negligible	1 to 4	No	Negligible	1 to 4
Met Mast 2	Negligible	1 to 4	No	Negligible	1 to 4

Borrow Pit 1a/1b (Carranstown)	Negligible	1 to 4	No	Negligible	1 to 4
Borrow Pit 2	Negligible	1 to 4	No	Negligible	1 to 4
Car Park 1	Low	5 to 10	No	Low	5 to 10
Substation	Negligible	1 to 4	No	Negligible	1 to 4
Construction Compound 1	Low	5 to 10	No	Low	5 to 10
Construction Compound 2	Negligible	1 to 4	No	Negligible	1 to 4
Construction Compound 3	Negligible	1 to 4	No	Negligible	1 to 4
Construction Compound 4	Negligible	1 to 4	No	Negligible	1 to 4
Construction Compound 5	Negligible	1 to 4	No	Negligible	1 to 4

9. INDICTATIVE FOUNDATION TYPE AND FOUNDATION DEPTH FOR TURBINES

9.1 Summary

Based on a review of the ground investigation information for site, a preliminary assessment of the likely foundation type and founding depths for each turbine location was carried out, where possible. A summary of this assessment is provided in Table 9-1.

Table 9-1: Summary of Indicative Turbine Foundation Type and Founding Depths

Turbine No.	Turbine Foundation Type	Relevant GI	Indicative founding depth (m bgl)	Comment
T1	Piled foundation	TP B	-	The site investigation works carried out indicate that a piled foundation will be required.
T2	Piled foundation	TP Z	-	The site investigation works carried out indicate that a piled foundation will be required.
T3	Piled foundation	TP N	-	The site investigation works carried out indicate that a piled foundation will be required.
T4	Piled foundation	TP A	-	The site investigation works carried out indicate that a piled foundation will be required.
T5	Piled foundation	TP Y	-	The site investigation works carried out indicate that a piled foundation will be required.
T6	Piled foundation	TP F	-	The site investigation works carried out indicate that a piled foundation will be required.
T7	Piled foundation	TP P	-	The site investigation works carried out indicate that a piled foundation will be required.
T8	Piled foundation	TP X	-	The site investigation works carried out indicate that a piled foundation will be required.
T9	Piled foundation	TP O	-	The site investigation works carried out indicate that a piled foundation will be required.

Turbine No.	Turbine Foundation Type	Relevant GI	Indicative founding depth (m bgl)	Comment
T10	Piled foundation	TP E	-	The site investigation works carried out indicate that a piled foundation will be required.
T11	Piled foundation	TP C	-	The site investigation works carried out indicate that a piled foundation will be required.
T12	Piled foundation	TP D	-	The site investigation works carried out indicate that a piled foundation will be required.
T13	Piled foundation	TP V	-	The site investigation works carried out indicate that a piled foundation will be required.
T14	Piled foundation	TP T	-	The site investigation works carried out indicate that a piled foundation will be required.
T15	Piled foundation	TP Q	-	The site investigation works carried out indicate that a piled foundation will be required.
T16	Piled foundation	TP U	-	The site investigation works carried out indicate that a piled foundation will be required.
T17	Piled foundation	TP S	-	The site investigation works carried out indicate that a piled foundation will be required.
T18	Piled foundation	TP R	-	The site investigation works carried out indicate that a piled foundation will be required.
T19	Piled foundation	TP M	-	The site investigation works carried out indicate that a piled foundation will be required.
T20	Piled foundation	TP K	-	The site investigation works carried out indicate that a piled foundation will be required.
T21	Piled foundation	TP L	-	The site investigation works carried out indicate that a piled foundation will be required.
T22	Piled foundation	TP H	-	The site investigation works carried out indicate that a piled foundation will be required.

Turbine No.	Turbine Foundation Type	Relevant GI	Indicative founding depth (m bgl)	Comment
T23	Piled foundation	TP I	-	The site investigation works carried out indicate that a piled foundation will be required.
T24	Piled foundation	TP G	-	The site investigation works carried out indicate that a piled foundation will be required.
T25	Piled foundation	TP W	-	The site investigation works carried out indicate that a piled foundation will be required.
T26	Piled foundation	TP J	-	The site investigation works carried out indicate that a piled foundation will be required.
Substation	Raft foundation on imported structural fill	BH-02 to BH14, TP01-29	-	The site investigation works carried out indicate that a gravity foundation will be required.

It should be noted that further ground investigation will be carried out prior to construction at each turbine location in the form of a borehole with in-situ SPT testing at 1m intervals in the overburden and follow-on rotary core through bedrock to confirm the foundation types and founding stratums assumed in Table 9-1. It is likely that following the completion of further ground investigation prior to construction that a number of the turbine bases will be deemed suitable for gravity type foundations.

For gravity type turbine foundations, where the depth of excavation exceeds the required founding depth for the proposed turbine base, up-fill material consisting of granular fill (6N) shall be used to backfill the excavation to the required founding depth.

For the piled turbine foundations, a typical piling type and configuration could be up to 16 no. 1200-1600mm diameter rotary bored piles.

10. FOUNDING DETAILS FOR OTHER INFRASTRUCTURE ELEMENTS

10.1 Access Roads

Floating access roads are the predominant road construction type proposed for the site which given the ground conditions and type of terrain present is deemed an appropriate construction approach.

The total length of new proposed access road to be constructed on site is approximately 28km (see Figure 1.1 of the Peat & Spoil Management Plan).

The typical make-up of the founded access roads is a minimum stone thickness of 800mm. The requirement for a layer of geotextile and geogrid and the necessary stone thickness will be confirmed at detailed design stage.

Refer to the Peat & Spoil Management Plan for Ballivor wind farm for further details on the proposed access roads on site.

10.2 Crane Hardstands

The crane hardstands will be constructed using the founded technique (i.e. not floated technique).

Crane hardstands are constructed using compacted Class 1/6F material on a suitable sub-formation to achieve the required bearing resistance. The hardstands will be designed for the most critical loading combinations from the crane.

The hardstands will require to be founded on competent material underlying the peat deposits. The founding levels for the hardstands will be variable across the site and will be determined during detailed ground investigation/design stage.

The typical make-up of the hardstands will include a minimum of 1.0m of granular stone fill with possibly a layer of geotextile and/or geogrid.

10.3 Substation Foundations & Platforms

The substation platform will be constructed using the founded technique (i.e. not floated technique). The substation foundations may comprise strip/raft foundations under the main footprint of the building with possibly a basement/pit for cable connections.

Substation platforms are constructed using compacted Class 1/6F material in accordance with Eirgrid/ESB network requirements on a suitable sub-formation to achieve the required bearing resistance.

The substation platform will require to be founded on competent material underlying the peat deposits.

Given the ground conditions present at the proposed substations, it is envisaged that the foundations will require to be founded on glacial till. The peat and lacustrine soils will not be a suitable founding stratum for the substation foundations.

Typical founding depth for substation platforms is likely to be 1.5-3.5m bgl.

The typical make-up of the substation platform will require approximately 4.0-5.0m of granular stone fill due to the thickness of peat, with possibly a layer of geotextile and/or geogrid. At the underside of the substation foundations, a layer of structural up-fill (class 6N/6P) in accordance with Eirgrid requirements will likely be required.

10.4 Construction Compound Platforms

The construction compound platforms will be constructed using the founded or floated technique as appropriate.

The construction compound platforms are generally constructed using compacted Class 1/6F material on a suitable sub-formation to achieve the required bearing resistance.

The construction compound platforms will require to be founded on material underlying the peat deposits.

Typical founding depth for construction compound platforms will require excavations from 1.0m to 4.5m bgl, where founded.

The typical make-up of the construction compound platform will include a minimum of 1000mm of granular stone fill with possibly a layer of geotextile and/or geogrid.

10.5 Met Mast Foundations

The met mast foundation will likely comprise gravity type foundation.

Given the ground conditions present at the proposed met mast, it is envisaged that the foundation will require to be founded on a competent stratum below the peat.

Typical founding depth for the met mast foundation is envisaged to be 2.5 to 3.0m bgl. At the underside of the met mast foundation, a layer of structural up-fill (class 6N) will be required.

11. SUMMARY AND RECOMMENDATIONS

11.1 Summary

The following summary is given.

FT was engaged by MKO to undertake a geotechnical and peat stability assessment of the proposed Ballivor wind farm site.

The findings of the peat assessment showed that the site has an acceptable margin of safety and is suitable for the proposed wind farm development. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

The site which is typically flat consists predominantly of bare locally re-vegetated cut-away peat and intact shallow peat. The site has been extensively harvested and drained by Bord na Móna.

Peat depth recorded during the site walkover and from the ground investigation ranged from 0.4 to 4.9m with an average peat depth of 1.7m. 40% of the probes recorded peat depths of less than 1.5m, with 67% of peat depth probes recorded peat depths of less than 2.0m and 94% of peat depth probes recorded peat depths of less than 3.0m. A number of localised readings recorded peat depths from 3.0 to 4.9m.

Slope inclinations at the main infrastructure locations range from 2 to 4 degrees.

An analysis of peat sliding was carried out at the main infrastructure locations across site for both the undrained and drained conditions. The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes.

For the undrained condition, the calculated FoS for load conditions (1) and (2) for the locations analysed, showed that all locations have an acceptable FoS of greater than 1.3, indicating a low risk of peat failure. The undrained analysis would be considered the most critical condition for the peat slopes.

A drained analysis was also carried out, which examined the effect of in particular, rainfall on the existing stability of the natural peat slopes on site. For the drained condition, the calculated FoS for load conditions (1) & (2) for the locations analysed, showed that all locations have an acceptable FoS of greater than 1.3.

The peat stability risk assessment at each infrastructure location identified a number of mitigation/control measures to reduce the potential risk of peat failure. Sections of access roads to the nearest infrastructure element should be subject to the same mitigation/control measures that apply to the nearest infrastructure element. See Appendix B for details of the required mitigation/control measures for each infrastructure element.

In summary, the findings of the peat assessment showed that the proposed Ballivor wind farm site has an acceptable margin of safety, is suitable for the proposed wind farm development and is considered to be at **low** risk of peat failure. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

11.2 Recommendations

The following recommendations are given.

Notwithstanding that the site has an acceptable margin of safety a number of mitigation/control measures are given to ensure that all works adhere to an acceptable standard of safety for work in peatlands. Mitigation/control measures identified for each of the infrastructure elements in the risk assessment will be taken into account and implemented throughout design and construction works (Appendix B).

Figure 4-2 shows areas which have an elevated or higher construction risk due to the terrain and features encountered during the site reconnaissance i.e. presence of relatively deep peat. Figure 7-1 shows the results of the factor of safety (FoS) analysis for the peat slopes on site for the most critical load condition.

Recommendations and guidelines given in FT's report 'Peat & Spoil Management Plan - Ballivor Wind Farm (FT 2021), included as Appendix 4.2 of the EIAR, should be implemented during the design and construction stage of the wind farm development.

To minimise the risk of construction activity causing potential peat instability the Construction Method Statements (CMSs) for the project will take into account, but not be limited, to the recommendations above. This will ensure that best practice guidance regarding the management of peat stability will be inherent in the construction phase.

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APPENDIX A

Photos from Site Walkover

Photo 1: Partially revegetated worked peatland

Photo 2:Open worked peatland

Photo 3: Open peatland with ponded water

Photo 4: Revegetated worked peatland

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APPENDIX B

Peat Stability Risk Registers

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T1

Grid Reference (Eastings, Northings):	665162	753511
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.1 - 2.35	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.85 (u), 4.88 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T1**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T2

Grid Reference (Eastings, Northings):	665604	753276
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.0 - 1.75	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.57 (u), 4.37 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T2**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T3

Grid Reference (Eastings, Northings):	665983	752965
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	0.4 - 0.85	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 12.40 (u), 13.42 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T3**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T4

Grid Reference (Eastings, Northings):	665796	752196
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	2.7 - 2.9	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.03 (u), 2.73 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T4**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T5

Grid Reference (Eastings, Northings):	665231	752587
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	2.1 - 4.9	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 3.89 (u), 2.34 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T5**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T6

Grid Reference (Eastings, Northings):	664502	752692
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.0 - 2.10	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.94 (u), 3.64 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T6**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T7

Grid Reference (Eastings, Northings):	665928	751694
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	3.6 - 4.4	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 2.13 (u), 1.31 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T7**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T8

Grid Reference (Eastings, Northings):	665164	751792
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	0.7 - 3.80	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.78 (u), 3.02 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T8**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T9

Grid Reference (Eastings, Northings):	664623	752007
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.5 - 2.9	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.88 (u), 3.95 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T9**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T10

Grid Reference (Eastings, Northings):	663783	752452
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	0.7 - 2.05	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.52 (u), 5.59 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	3	1	3	Negligible	No		2	1	2	Negligible
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T10**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T11

Grid Reference (Eastings, Northings):	663976	753121
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.0 - 1.2	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.29 (u), 6.96 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		2	1	2	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T11**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T12

Grid Reference (Eastings, Northings):	664329	753719
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	2.1 - 3.5	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.10 (u), 3.28 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T12**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T13

Grid Reference (Eastings, Northings):	663739	757007
Distance to Watercourse (m)	50 - 100	
Min & Max Measured Peat Depth (m):	1.7 - 2.8	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.04 (u), 4.10 (d)	1	3	3	Negligible	No	See Below	1	3	3	Negligible
2	Evidence of sub peat water flow	1	3	3	Negligible	No		1	3	3	Negligible
3	Evidence of surface water flow	3	3	9	Low	No		2	3	6	Low
4	Evidence of previous failures/slips	0	3	0	Not Applicable	No		0	3	0	Not Applicable
5	Type of vegetation	2	3	6	Low	No		2	3	6	Low
6	General slope characteristics upslope/downslope from infrastructure location	2	3	6	Low	No		2	3	6	Low
7	Evidence of very soft/soft clay at base of peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
8	Evidence of mechanically cut peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
10	Evidence of bog pools	0	3	0	Not Applicable	No		0	3	0	Not Applicable
11	Relatively deep peat	3	3	9	Low	No		2	3	6	Low

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T13**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T14

Grid Reference (Eastings, Northings):	663474	757496
Distance to Watercourse (m)	50 - 100	
Min & Max Measured Peat Depth (m):	0.4 - 1.2	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.96 (u), 6.38 (d)	1	3	3	Negligible	No	See Below	1	3	3	Negligible
2	Evidence of sub peat water flow	1	3	3	Negligible	No		1	3	3	Negligible
3	Evidence of surface water flow	3	3	9	Low	No		2	3	6	Low
4	Evidence of previous failures/slips	0	3	0	Not Applicable	No		0	3	0	Not Applicable
5	Type of vegetation	2	3	6	Low	No		2	3	6	Low
6	General slope characteristics upslope/downslope from infrastructure location	2	3	6	Low	No		2	3	6	Low
7	Evidence of very soft/soft clay at base of peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
8	Evidence of mechanically cut peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
10	Evidence of bog pools	0	3	0	Not Applicable	No		0	3	0	Not Applicable
11	Other	0	3	0	Not Applicable	No		0	3	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T14**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T15

Grid Reference (Eastings, Northings):	662595	757805
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	2.4 - 2.8	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.25 (u), 2.94 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T15**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T16

Grid Reference (Eastings, Northings):	662765	757323
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	2.5 - 4.1	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.50 (u), 2.80 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T16**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T17

Grid Reference (Eastings, Northings):	662002	756804
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	0.6 - 1.0	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.05 (u), 6.39 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T17**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T18

Grid Reference (Eastings, Northings):	661508	757054
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	2.2 - 4.4	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 2.13 (u), 1.31 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T18**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T19

Grid Reference (Eastings, Northings):	665118	758520
Distance to Watercourse (m)	100 - 150	
Min & Max Measured Peat Depth (m):	2.0 - 2.8	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 3.03 (u), 2.05 (d)	1	2	2	Negligible	No		1	2	2	Negligible
2	Evidence of sub peat water flow	1	2	2	Negligible	No		1	2	2	Negligible
3	Evidence of surface water flow	3	2	6	Low	No		2	2	4	Negligible
4	Evidence of previous failures/slips	0	2	0	Not Applicable	No		0	2	0	Not Applicable
5	Type of vegetation	2	2	4	Negligible	No		2	2	4	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	2	4	Negligible	No	See Below	2	2	4	Negligible
7	Evidence of very soft/soft clay at base of peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
8	Evidence of mechanically cut peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
10	Evidence of bog pools	0	2	0	Not Applicable	No		0	2	0	Not Applicable
11	Relatively deep peat	3	2	6	Low	No		2	2	4	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T19**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T20

Grid Reference (Eastings, Northings):	665844	758647
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.6 - 2.0	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.65 (u), 5.73 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T20**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T21

Grid Reference (Eastings, Northings):	664274	759054
Distance to Watercourse (m)	100 - 150	
Min & Max Measured Peat Depth (m):	0.8 - 1.0	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 8.06 (u), 8.50 (d)	1	2	2	Negligible	No	See Below	1	2	2	Negligible
2	Evidence of sub peat water flow	1	2	2	Negligible	No		1	2	2	Negligible
3	Evidence of surface water flow	3	2	6	Low	No		2	2	4	Negligible
4	Evidence of previous failures/slips	0	2	0	Not Applicable	No		0	2	0	Not Applicable
5	Type of vegetation	2	2	4	Negligible	No		2	2	4	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	2	4	Negligible	No		2	2	4	Negligible
7	Evidence of very soft/soft clay at base of peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
8	Evidence of mechanically cut peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	2	0	Not Applicable	No		2	2	4	Negligible
10	Evidence of bog pools	0	2	0	Not Applicable	No		0	2	0	Not Applicable
11	Other	0	2	0	Not Applicable	No		0	2	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T21**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T22

Grid Reference (Eastings, Northings):	664023	759553
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.2 - 1.6	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 9.56 (u), 8.19 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T22**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T23

Grid Reference (Eastings, Northings):	664744	759727
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	2.1 - 3.1	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.59 (u), 3.70 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	3	1	3	Negligible	No		2	1	2	Negligible
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T23**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T24

Grid Reference (Eastings, Northings):	665464	759850
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.6 - 3.35	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 3.52 (u), 2.28 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	3	1	3	Negligible	No		2	1	2	Negligible
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T24**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T25

Grid Reference (Eastings, Northings):	665735	759326
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	2.0 - 3.85	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.73 (u), 2.98 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T25**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Turbine T26

Grid Reference (Eastings, Northings):	665028	759172
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.7 - 2.3	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.95 (u), 4.99 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	3	1	3	Negligible	No		2	1	2	Negligible
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Turbine T26**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
v	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vi	Based on available ground investigaiton, a piled turbine foundation may be required.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Met. Mast (1)

Grid Reference (Eastings, Northings):	661518	756595
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	2.5 - 3.0	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.73 (u), 3.82 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Negligible	No		3	1	3	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Relatively deep peat	3	1	3	Negligible	No		2	1	2	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Met. Mast** 1
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Met. Mast (2)

Grid Reference (Eastings, Northings):	**663677**	**752816**
Distance to Watercourse (m)	**> 150**	
Min & Max Measured Peat Depth (m):	**1.5 - 2.0**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.65 (u), 5.73 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Negligible	No		3	1	3	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Met. Mast 2**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Car Park (1)

Grid Reference (Eastings, Northings):	664349	757812
Distance to Watercourse (m)	50 - 100	
Min & Max Measured Peat Depth (m):	1.0 - 2.0	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.10 (u), 3.83 (d)	1	3	3	Negligible	No	See Below	1	3	3	Negligible
2	Evidence of sub peat water flow	1	3	3	Negligible	No		1	3	3	Negligible
3	Evidence of surface water flow	3	3	9	Low	No		3	3	9	Low
4	Evidence of previous failures/slips	0	3	0	Not Applicable	No		0	3	0	Not Applicable
5	Type of vegetation	2	3	6	Low	No		2	3	6	Low
6	General slope characteristics upslope/downslope from infrastructure location	3	3	9	Low	No		3	3	9	Low
7	Evidence of very soft/soft clay at base of peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
8	Evidence of mechanically cut peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	3	0	Not Applicable	No		0	3	0	Not Applicable
10	Evidence of bog pools	0	3	0	Not Applicable	No		0	3	0	Not Applicable
11	Other	0	3	0	Not Applicable	No		0	3	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Car Park 1**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Substation

Grid Reference (Eastings, Northings):	663666	755339
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.0 - 1.9	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 8.19 (u), 6.04 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Negligible	No		3	1	3	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Substation 1**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Const. Comp. (1)

Grid Reference (Eastings, Northings):	663980	757341
Distance to Watercourse (m)	100 - 150	
Min & Max Measured Peat Depth (m):	2.1 - 3.1	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.59 (u), 3.70 (d)	1	2	2	Negligible	No	See Below	1	2	2	Negligible
2	Evidence of sub peat water flow	1	2	2	Negligible	No		1	2	2	Negligible
3	Evidence of surface water flow	3	2	6	Low	No		3	2	6	Low
4	Evidence of previous failures/slips	0	2	0	Not Applicable	No		0	2	0	Not Applicable
5	Type of vegetation	2	2	4	Negligible	No		2	2	4	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	2	6	Low	No		3	2	6	Low
7	Evidence of very soft/soft clay at base of peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
8	Evidence of mechanically cut peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
10	Evidence of bog pools	0	2	0	Not Applicable	No		0	2	0	Not Applicable
11	Relatively deep peat	3	2	6	Low	No		2	2	4	Negligible

	Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 1**
i	Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required: - excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle - temporary works designer may be required to provide excavation support design -daily detailed inspection of excavation faces -potential for greater water inflow into excavation requiring removal of water using pumping -increased exclusion zone around excavation to avoid accidental loading of crest of slope
ii	Maintain hydrology of area as far as possible;
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.
vi	Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed.
vii	Based on available ground investigaiton, a piled turbine foundation may be required.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Const. Comp. (2)

Grid Reference (Eastings, Northings):	**663517**	**755194**
Distance to Watercourse (m)	**> 150**	
Min & Max Measured Peat Depth (m):	**0.5 - 1.9**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.91 (u), 6.04 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Negligible	No		3	1	3	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 2**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Main Const. Comp.

Grid Reference (Eastings, Northings):	664542	754056
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	1.2 - 1.8	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 8.82 (u), 6.37 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Negligible	No		3	1	3	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 3**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Const. Comp. (4)

Grid Reference (Eastings, Northings):	661791	756641
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	0.9 - 2.0	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.65 (u), 5.73 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Negligible	No		3	1	3	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 4**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Const. Comp. (5)

Grid Reference (Eastings, Northings):	**665323**	**751430**
Distance to Watercourse (m)	**> 150**	
Min & Max Measured Peat Depth (m):	**0.8 - 1.8**	
Control Required:	**No**	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 8.19 (u), 6.37 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Negligible	No		3	1	3	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 5**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Borrow Pit 1a/1b

Grid Reference (Eastings, Northings):	**664226 755100**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0 - 2.1**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.60 (u), 3.83 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Negligible	No		3	1	3	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Borrow Pit 1/1a**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Borrow Pit 2

Grid Reference (Eastings, Northings):	665330	751430
Distance to Watercourse (m)	> 150	
Min & Max Measured Peat Depth (m):	0 - 2.1	
Control Required:	No	

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.60 (u), 3.83 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		3	1	3	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	3	1	3	Negligible	No		3	1	3	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Borrow Pit 2**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from Site Entrance to T12

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.5-2.0**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.12 (u), 5.10 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Main Entrance Road to T12**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T12 to T1

Grid Reference (Eastings, Northings):	Varies
Distance to Watercourse (m)	> 150
Min & Max Measured Peat Depth (m):	1.1-1.9
Control Required:	No

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.61 (u), 4.03 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T12 to T1**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T1 to T2

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.8-3.1**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.59 (u), 3.70 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T1 to T2**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T2 to T3

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.2-2.0**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.65 (u), 5.73 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T2to T3**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T3 to T4

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.5-2.4**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.50 (u), 3.19 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T3 to T4**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T4 to T7

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.3-1.9**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.50 (u), 3.19 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T4 to T7**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T7 to T8

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.0-1.8**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.12 (u), 5.10(d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T7 to T8**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T8 to T9

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**< 50**
Min & Max Measured Peat Depth (m):	**0.9-3.3**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 3.56 (u), 2.32 (d)	1	4	4	Negligible	No		1	4	4	Negligible
2	Evidence of sub peat water flow	1	4	4	Negligible	No		1	4	4	Negligible
3	Evidence of surface water flow	3	4	12	Medium	No		2	4	8	Low
4	Evidence of previous failures/slips	0	4	0	Not Applicable	No		0	4	0	Not Applicable
5	Type of vegetation	2	4	8	Low	No		1	4	4	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	4	8	Low	No	See Below	2	4	8	Low
7	Evidence of very soft/soft clay at base of peat	0	4	0	Not Applicable	No		0	4	0	Not Applicable
8	Evidence of mechanically cut peat	0	4	0	Not Applicable	No		0	4	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	4	4	Negligible	No		1	4	4	Negligible
10	Evidence of bog pools	0	4	0	Not Applicable	No		0	4	0	Not Applicable
11	Other	0	4	0	Not Applicable	No		0	4	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T8 to T9**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	**Road from T9 to T10**

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.8-2.3**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.00 (u), 4.42 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T9 to T10**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T10 - Met. Mast

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.0-1.7**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.26 (u), 3.38 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T10 to Met Mast**
i	Maintain hydrology of area as far as possible;
ii	Installation of appropriate drainge measures to alleviate ingress of surface water into excavations
iii	Use of experienced geotechnical staff for site investigation;
iv	Use of experienced contractors and trained operators to carry out the work;
v	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from Met. Mast to T6

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.6-1.4**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.65 (u), 5.73 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		1	1	1	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Met Mast to T6**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T6 to T5

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.1-2.7**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.20 (u), 4.25 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T6 to T5**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T5 to T4

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.0-2.1**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.40 (u), 5.46 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T5 to T4**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from Met. Mast to T12

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.6-2.8**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 3.03 (u), 2.05 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Met Mast to T12**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	**Site Entance to Borrow Pit 1a/b.**

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.5-3.0**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 3.28 (u), 2.30 (d)	1	1	1	Negligible	No		1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No	See Below	2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Site Entrance to Borrow Pit 1a/b**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from Borrow Pit 1a/b to T13

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.5-1.8**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.11 (u), 3.19 (d)	1	1	1	Negligible	No		1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No	See Below	2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Borrow Pit 1a/b to T13**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T13 to CCP1

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.0-2.0**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 8.50 (u), 6.75 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T13 to CCP1**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from CCP1 to T19

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**< 50**
Min & Max Measured Peat Depth (m):	**0.6-2.0**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.33 (u), 2.67 (d)	1	4	4	Negligible	No	See Below	1	4	4	Negligible
2	Evidence of sub peat water flow	1	4	4	Negligible	No		1	4	4	Negligible
3	Evidence of surface water flow	3	4	12	Medium	No		2	4	8	Low
4	Evidence of previous failures/slips	0	4	0	Not Applicable	No		0	4	0	Not Applicable
5	Type of vegetation	2	4	8	Low	No		1	4	4	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	4	8	Low	No		2	4	8	Low
7	Evidence of very soft/soft clay at base of peat	0	4	0	Not Applicable	No		0	4	0	Not Applicable
8	Evidence of mechanically cut peat	0	4	0	Not Applicable	No		0	4	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	4	4	Negligible	No		1	4	4	Negligible
10	Evidence of bog pools	0	4	0	Not Applicable	No		0	4	0	Not Applicable
11	Other	0	4	0	Not Applicable	No		0	4	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **CCP1 to T19**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T19 to T20

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.1-1.5**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 9.17 (u), 7.65 (d)	1	1	1	Negligible	No		1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No	See Below	2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **Spur to T3**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T19 to T21

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.6-1.5**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.60 (u), 3.83 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T19 to T21**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T21 to T22

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**100 - 150**
Min & Max Measured Peat Depth (m):	**1.0-2.0**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.10 (u), 3.83 (d)	1	2	2	Negligible	No	See Below	1	2	2	Negligible
2	Evidence of sub peat water flow	1	2	2	Negligible	No		1	2	2	Negligible
3	Evidence of surface water flow	3	2	6	Low	No		2	2	4	Negligible
4	Evidence of previous failures/slips	0	2	0	Not Applicable	No		0	2	0	Not Applicable
5	Type of vegetation	2	2	4	Negligible	No		1	2	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	2	4	Negligible	No		2	2	4	Negligible
7	Evidence of very soft/soft clay at base of peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
8	Evidence of mechanically cut peat	0	2	0	Not Applicable	No		0	2	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	2	2	Negligible	No		1	2	2	Negligible
10	Evidence of bog pools	0	2	0	Not Applicable	No		0	2	0	Not Applicable
11	Other	0	2	0	Not Applicable	No		0	2	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T21 to T22**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T22 to T23

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.3-2.0**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.65 (u), 5.73 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T22 to T23**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T23 to T24

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**2.1-4.2**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 4.50 (u), 3.19 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T23 to T24**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T24 to T25

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.6-1.5**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.10 (u), 3.83 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		2	1	2	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T24 to T25**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	**Road from T25 to T26**

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.6-1.7**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 8.50 (u), 6.75 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T25 to T26**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	**Road from T26 to T21**

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.9-1.5**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.66 (u), 5.89 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T26 to T21**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T13 - T14

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.2-2.0**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 7.65 (u), 5.73 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T13 to T14**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T14 to T15

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.1-2.6**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.10 (u), 3.83 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T14 to T15**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	**Road from T15 to T16**

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.1-2.0**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 5.10 (u), 3.83 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T15 to T16**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T16 to T17

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.7-2.8**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 6.04 (u), 4.10 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T16 to T17**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T17 to T18

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**0.8-2.5**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 3.28 (u), 2.30 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T17 to T18**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

Location:	Road from T17 to Borrow Pit 2

Grid Reference (Eastings, Northings):	**Varies**
Distance to Watercourse (m)	**> 150**
Min & Max Measured Peat Depth (m):	**1.0-3.2**
Control Required:	**No**

		Pre-Control Measure Implementation						Post-Control Measure Implementation			
Ref.	Contributory/Qualitative Factors to Potential Peat Failure	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating	Control Required	Control measures to be implemented during construction	Prob (Note 2)	Impact (Note 3)	Risk	Risk Rating
1	FOS = 3.64 (u), 2.39 (d)	1	1	1	Negligible	No	See Below	1	1	1	Negligible
2	Evidence of sub peat water flow	1	1	1	Negligible	No		1	1	1	Negligible
3	Evidence of surface water flow	3	1	3	Negligible	No		2	1	2	Negligible
4	Evidence of previous failures/slips	0	1	0	Not Applicable	No		0	1	0	Not Applicable
5	Type of vegetation	2	1	2	Negligible	No		1	1	1	Negligible
6	General slope characteristics upslope/downslope from infrastructure location	2	1	2	Negligible	No		2	1	2	Negligible
7	Evidence of very soft/soft clay at base of peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
8	Evidence of mechanically cut peat	0	1	0	Not Applicable	No		0	1	0	Not Applicable
9	Evidence of quaking or buoyant peat	1	1	1	Negligible	No		1	1	1	Negligible
10	Evidence of bog pools	0	1	0	Not Applicable	No		0	1	0	Not Applicable
11	Other	0	1	0	Not Applicable	No		0	1	0	Not Applicable

	Control Measures to be Implemented Prior to/and During Construction for **T17 to Borrow Pit 2**
i	Maintain hydrology of area as far as possible;
ii	Use of experienced geotechnical staff for site investigation;
iii	Use of experienced contractors and trained operators to carry out the work;
iv	Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.

Note

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

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APPENDIX C

Calculated FOS for Peat Slopes on Site

Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Undrained Analysis

Turbine No./Waypoint	Easting	Northing	Slope	Undrained shear strength	Bulk unit weight of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
T01	665162	753511	2	8	10	2.35	3.4	**9.76**	**6.85**
T02	665604	753275	3	8	10	1.75	2.8	**8.75**	**5.57**
T03	665983	752965	2	8	10	0.85	1.9	**26.98**	**12.40**
T04	665796	752196	3	8	10	2.80	3.8	**5.47**	**4.03**
T05	665231	752587	2	8	10	4.90	5.9	**4.68**	**3.89**
T06	664502	752692	3	8	10	2.10	3.1	**7.29**	**4.94**
T07	665928	751694	4	8	10	4.40	5.4	**2.61**	**2.13**
T08	665164	751792	2	8	10	3.80	4.8	**6.04**	**4.78**
T09	664623	752007	2	8	10	2.90	3.9	**7.91**	**5.88**
T10	663783	752452	2	8	10	2.05	3.1	**11.19**	**7.52**
T11	663976	753121	3	8	10	1.1	2.1	**13.92**	**7.29**
T12	664329	753719	2	8	10	3.5	4.5	**6.55**	**5.10**
T13	663739	757007	2	8	10	2.8	3.8	**8.19**	**6.04**
T14	663474	757496	3	8	10	1.2	2.2	**12.76**	**6.96**
T15	662595	757805	3	8	10	2.6	3.6	**5.89**	**4.25**
T16	662765	757323	2	8	10	4.1	5.1	**5.59**	**4.50**
T17	662002	756804	4	8	10	0.9	1.9	**12.77**	**6.05**
T18	661508	757054	4	8	10	4.4	5.4	**2.61**	**2.13**
T19	665118	758520	4	8	10	2.8	3.8	**4.11**	**3.03**
T20	665844	758647	2	8	10	2	3.0	**11.47**	**7.65**
T21	664274	759054	3	8	10	0.9	1.9	**17.01**	**8.06**
T22	664023	759553	2	8	10	1.4	2.4	**16.38**	**9.56**
T23	664744	759727	2	8	10	3.1	4.1	**7.40**	**5.59**
T24	665464	759850	3	8	10	3.35	4.4	**4.57**	**3.52**
T25	665735	759326	2	8	10	3.85	4.9	**5.96**	**4.73**
T26	665028	759172	2	8	10	2.3	3.3	**9.97**	**6.95**
R7	659651	757657	2	8	10	1.5	2.5	**15.29**	**9.17**
R9	659841	757721	3	8	10	1.1	2.1	**13.92**	**7.29**
R11	660029	757697	2	8	10	1.8	2.8	**12.74**	**8.19**
R13	660211	757616	2	8	10	2.1	3.1	**10.92**	**7.40**
R15	660389	757526	2	8	10	2.8	3.8	**8.19**	**6.04**
R17	660455	757345	3	8	10	2.5	3.5	**6.12**	**4.37**
R19	660517	757155	2	8	10	2.1	3.1	**10.92**	**7.40**
R21	660638	756999	3	8	10	2.1	3.1	**7.29**	**4.94**
R23	660819	756918	3	8	10	2.5	3.5	**6.12**	**4.37**
R25	661012	756908	3	8	10	2.7	3.7	**5.67**	**4.14**
R27	661200	756977	3	8	10	2.2	3.2	**6.96**	**4.78**
R29	661388	757046	4	8	10	2.6	3.6	**4.42**	**3.19**
R31	661584	757082	4	8	10	2.5	3.5	**4.60**	**3.28**
R33	661781	757116	4	8	10	0.8	1.8	**14.37**	**6.39**
R35	661978	757151	3	8	10	1.5	2.5	**10.20**	**6.12**
R37	662175	757185	2	8	10	2.8	3.8	**8.19**	**6.04**
R39	662372	757220	2	8	10	0.7	1.7	**32.77**	**13.49**
R41	662569	757254	2	8	10	1.5	2.5	**15.29**	**9.17**
R43	662762	757305	2	8	10	2	3.0	**11.47**	**7.65**
R45	662949	757376	2	8	10	1.8	2.8	**12.74**	**8.19**
R47	663135	757450	2	8	10	2	3.0	**11.47**	**7.65**
R49	663304	757557	2	8	10	2	3.0	**11.47**	**7.65**
R50	663391	757604	2	8	10	2.6	3.6	**8.82**	**6.37**
R52	663514	757463	2	8	10	1.2	2.2	**19.11**	**10.43**
R54	663608	757286	2	8	10	2	3.0	**11.47**	**7.65**
R56	663702	757110	2	8	10	1.5	2.5	**15.29**	**9.17**
R58	663795	756933	3	8	10	1.3	2.3	**11.77**	**6.66**
R60	663844	756749	3	8	10	0.5	1.5	**30.61**	**10.20**
R62	663786	756558	3	8	10	1	2.0	**15.31**	**7.65**
R64	663731	756366	3	8	10	1.2	2.2	**12.76**	**6.96**
R66	663736	756170	4	8	10	1.5	2.5	**7.66**	**4.60**
R68	663816	755988	4	8	10	1.8	2.8	**6.39**	**4.11**
R70	663926	755823	2	8	10	0.5	1.5	**45.87**	**15.29**
R71	663959	755729	2	8	10	1.7	2.7	**13.49**	**8.50**
R72	663999	755637	2	8	10	1.8	2.8	**12.74**	**8.19**
R73	664038	755545	3	8	10	1.8	2.8	**8.50**	**5.47**
R74	664081	755455	3	8	10	2.2	3.2	**6.96**	**4.78**
R75	664131	755368	2	8	10	0.4	1.4	**57.34**	**16.38**
R76	664181	755281	2	8	10	1	2.0	**22.94**	**11.47**
R77	664230	755194	4	8	10	1.5	2.5	**7.66**	**4.60**
R78	664280	755108	4	8	10	1.8	2.8	**6.39**	**4.11**
R79	664328	755020	2	8	10	2.4	3.4	**9.56**	**6.75**
R80	664376	754932	3	8	10	3.4	4.4	**4.50**	**3.48**
R81	664423	754844	3	8	10	3	4.0	**5.10**	**3.83**
R82	664470	754756	3	8	10	2.5	3.5	**6.12**	**4.37**
R83	664517	754668	4	8	10	2.5	3.5	**4.60**	**3.28**
R84	664563	754579	4	8	10	3	4.0	**3.83**	**2.87**
R85	664589	754516	4	8	10	2.2	3.2	**5.23**	**3.59**
R86	664612	754508	4	8	10	2	3.0	**5.75**	**3.83**
R90	664627	754112	3	8	10	1.5	2.5	**10.20**	**6.12**
R91	664610	754014	2	8	10	1.8	2.8	**12.74**	**8.19**
R92	664564	753930	2	8	10	2.1	3.1	**10.92**	**7.40**
R93	664485	753869	2	8	10	1.8	2.8	**12.74**	**8.19**
R94	664405	753808	2	8	10	2	3.0	**11.47**	**7.65**
R95	664332	753740	2	8	10	1.5	2.5	**15.29**	**9.17**
R96	664264	753667	3	8	10	2.8	3.8	**5.47**	**4.03**
R97	664196	753594	2	8	10	2.4	3.4	**9.56**	**6.75**
R98	664133	753516	3	8	10	2.6	3.6	**5.89**	**4.25**
R99	664077	753434	4	8	10	2.8	3.8	**4.11**	**3.03**
R100	664043	753340	4	8	10	2.4	3.4	**4.79**	**3.38**
R101	664009	753246	3	8	10	0.9	1.9	**17.01**	**8.06**

Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Undrained Analysis

Turbine No./Waypoint	Easting	Northing	Slope	Undrained shear strength	Bulk unit weight of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
R102	663974	753152	3	8	10	1.2	2.2	**12.76**	**6.96**
R103	663940	753058	3	8	10	0.4	1.4	**38.27**	**10.93**
R104	663906	752964	2	8	10	0.9	1.9	**25.49**	**12.07**
R105	663866	752873	2	8	10	0.6	1.6	**38.23**	**14.34**
R106	663817	752785	2	8	10	0.6	1.6	**38.23**	**14.34**
R107	663768	752698	3	8	10	1	2.0	**15.31**	**7.65**
R108	663719	752611	3	8	10	1.7	2.7	**9.00**	**5.67**
R109	663725	752520	4	8	10	1.7	2.7	**6.76**	**4.26**
R110	663801	752455	4	8	10	1.2	2.2	**9.58**	**5.23**
R111	663877	752390	4	8	10	1.8	2.8	**6.39**	**4.11**
R112	663954	752326	2	8	10	1.4	2.4	**16.38**	**9.56**
R113	664035	752270	2	8	10	1.3	2.3	**17.64**	**9.97**
R114	664132	752244	2	8	10	2.3	3.3	**9.97**	**6.95**
R115	664228	752219	4	8	10	0.8	1.8	**14.37**	**6.39**
R116	664325	752193	4	8	10	1.3	2.3	**8.84**	**5.00**
R117	664422	752167	4	8	10	1.2	2.2	**9.58**	**5.23**
R118	664518	752140	3	8	10	1.5	2.5	**10.20**	**6.12**
R119	664614	752113	3	8	10	1.5	2.5	**10.20**	**6.12**
R120	664710	752085	3	8	10	1	2.0	**15.31**	**7.65**
R121	664807	752058	3	8	10	3.3	4.3	**4.64**	**3.56**
R122	664887	751999	4	8	10	0.9	1.9	**12.77**	**6.05**
R123	664964	751936	4	8	10	2	3.0	**5.75**	**3.83**
R124	665042	751873	4	8	10	2.2	3.2	**5.23**	**3.59**
R125	665126	751821	3	8	10	1.5	2.5	**10.20**	**6.12**
R126	665221	751789	3	8	10	1.8	2.8	**8.50**	**5.47**
R127	665316	751757	3	8	10	1	2.0	**15.31**	**7.65**
R128	665410	751725	3	8	10	1.1	2.1	**13.92**	**7.29**
R129	665505	751693	2	8	10	1.2	2.2	**19.11**	**10.43**
R130	665600	751661	2	8	10	1.3	2.3	**17.64**	**9.97**
R131	665695	751629	3	8	10	1.5	2.5	**10.20**	**6.12**
R132	665789	751597	3	8	10	1.5	2.5	**10.20**	**6.12**
R133	665886	751575	3	8	10	1.7	2.7	**9.00**	**5.67**
R134	665939	751650	3	8	10	1.8	2.8	**8.50**	**5.47**
R135	665943	751750	2	8	10	2	3.0	**11.47**	**7.65**
R136	665948	751850	2	8	10	1.9	2.9	**12.07**	**7.91**
R137	665952	751950	2	8	10	1.3	2.3	**17.64**	**9.97**
R138	665957	752050	2	8	10	1.3	2.3	**17.64**	**9.97**
R139	665962	752149	2	8	10	1.5	2.5	**15.29**	**9.17**
R140	665966	752249	2	8	10	1.7	2.7	**13.49**	**8.50**
R141	665971	752349	2	8	10	1.7	2.7	**13.49**	**8.50**
R143	665988	752543	3	8	10	2.4	3.4	**6.38**	**4.50**
R145	665989	752739	2	8	10	2.1	3.1	**10.92**	**7.40**
R147	665998	752938	2	8	10	0.8	1.8	**28.67**	**12.74**
R149	665929	753104	2	8	10	2	3.0	**11.47**	**7.65**
R151	665755	753203	2	8	10	1.8	2.8	**12.74**	**8.19**
R152	665669	753252	2	8	10	1.2	2.2	**19.11**	**10.43**
R153	665582	753301	2	8	10	1.5	2.5	**15.29**	**9.17**
R154	665495	753351	2	8	10	1.8	2.8	**12.74**	**8.19**
R156	665321	753450	2	8	10	3.1	4.1	**7.40**	**5.59**
R158	665139	753530	3	8	10	1.6	2.6	**9.57**	**5.89**
R159	665044	753560	3	8	10	1.5	2.5	**10.20**	**6.12**
R161	664854	753623	3	8	10	1.9	2.9	**8.06**	**5.28**
R163	664667	753695	5	8	10	1	2.0	**9.21**	**4.61**
R165	664481	753767	2	8	10	1.1	2.1	**20.85**	**10.92**
R166	664396	753800	2	8	10	2	3.0	**11.47**	**7.65**
R168	663896	759442	3	8	10	2	3.0	**7.65**	**5.10**
R170	664003	759273	3	8	10	2	3.0	**7.65**	**5.10**
R171	664057	759189	3	8	10	1	2.0	**15.31**	**7.65**
R172	664112	759105	3	8	10	1.2	2.2	**12.76**	**6.96**
R174	664274	759038	4	8	10	1.2	2.2	**9.58**	**5.23**
R175	664373	759053	4	8	10	0.6	1.6	**19.16**	**7.19**
R176	664472	759069	4	8	10	1.5	2.5	**7.66**	**4.60**
R178	664669	759100	2	8	10	1.1	2.1	**20.85**	**10.92**
R180	664867	759131	3	8	10	1.3	2.3	**11.77**	**6.66**
R182	665064	759164	2	8	10	1.5	2.5	**15.29**	**9.17**
R183	665162	759185	2	8	10	1.5	2.5	**15.29**	**9.17**
R185	665357	759228	2	8	10	0.6	1.6	**38.23**	**14.34**
R187	665553	759271	2	8	10	1.7	2.7	**13.49**	**8.50**
R189	665748	759313	2	8	10	1.3	2.3	**17.64**	**9.97**
R191	665856	759427	2	8	10	0.6	1.6	**38.23**	**14.34**
R193	665724	759578	3	8	10	2	3.0	**7.65**	**5.10**
R195	665592	759728	2	8	10	1.5	2.5	**15.29**	**9.17**
R198	665383	759936	3	8	10	4.2	5.2	**3.64**	**2.94**
R200	665194	759873	3	8	10	2.1	3.1	**7.29**	**4.94**
R202	665006	759805	3	8	10	2.4	3.4	**6.38**	**4.50**
R205	664724	759703	2	8	10	1.1	2.1	**20.85**	**10.92**
R207	664530	759654	2	8	10	2	3.0	**11.47**	**7.65**
R209	664335	759609	2	8	10	1.3	2.3	**17.64**	**9.97**
R211	664140	759564	2	8	10	1.5	2.5	**15.29**	**9.17**
R213	663945	759519	2	8	10	1.4	2.4	**16.38**	**9.56**
R215	664576	759085	2	8	10	1	2.0	**22.94**	**11.47**
R216	664592	758987	2	8	10	0.9	1.9	**25.49**	**12.07**
R218	664629	758790	2	8	10	1.5	2.5	**15.29**	**9.17**
R220	664665	758593	2	8	10	0.9	1.9	**25.49**	**12.07**
R222	664647	758401	2	8	10	2	3.0	**11.47**	**7.65**
R224	664577	758213	3	8	10	1.3	2.3	**11.77**	**6.66**
R226	664508	758026	3	8	10	1.2	2.2	**12.76**	**6.96**
R228	664412	757851	3	8	10	0.7	1.7	**21.87**	**9.00**
R230	664268	757720	3	8	10	1	2.0	**15.31**	**7.65**
R232	664091	757627	3	8	10	1.5	2.5	**10.20**	**6.12**

Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Undrained Analysis

Turbine No./Waypoint	Easting	Northing	Slope	Undrained shear strength	Bulk unit weight of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
R234	663914	757534	3	8	10	1.2	2.2	**12.76**	**6.96**
R236	663737	757441	3	8	10	1	2.0	**15.31**	**7.65**
R238	663569	757352	2	8	10	1.6	2.6	**14.34**	**8.82**
R240	664767	758474	2	8	10	1.1	2.1	**20.85**	**10.92**
R242	664964	758508	2	8	10	0.6	1.6	**38.23**	**14.34**
R244	665161	758543	2	8	10	1	2.0	**22.94**	**11.47**
R246	665358	758577	2	8	10	1.1	2.1	**20.85**	**10.92**
R248	665555	758612	2	8	10	1.4	2.4	**16.38**	**9.56**
R250	665752	758646	2	8	10	1.5	2.5	**15.29**	**9.17**
R253	663092	757431	2	8	10	2	3.0	**11.47**	**7.65**
R255	662935	757555	3	8	10	1.1	2.1	**13.92**	**7.29**
R257	662778	757679	3	8	10	2	3.0	**7.65**	**5.10**
R259	662622	757804	4	8	10	2.5	3.5	**4.60**	**3.28**
R261	661812	757122	4	8	10	2	3.0	**5.75**	**3.83**
R263	661895	756941	4	8	10	1.5	2.5	**7.66**	**4.60**
R265	662009	756777	3	8	10	2.1	3.1	**7.29**	**4.94**
R267	661910	756919	3	8	10	1.4	2.4	**10.93**	**6.38**
R269	661735	756838	3	8	10	1.9	2.9	**8.06**	**5.28**
R270	661766	756743	2	8	10	1	2.0	**22.94**	**11.47**
R272	661793	756545	2	8	10	1.5	2.5	**15.29**	**9.17**
R274	661776	756648	2	8	10	2	3.0	**11.47**	**7.65**
R275	661683	756613	2	8	10	2.1	3.1	**10.92**	**7.40**
R277	661552	756582	2	8	10	2	3.0	**11.47**	**7.65**
R284	661884	756460	3	8	10	2.1	3.1	**7.29**	**4.94**
R286	661688	756420	3	8	10	1.5	2.5	**10.20**	**6.12**
R288	661492	756382	3	8	10	3.2	4.2	**4.78**	**3.64**
R290	661296	756343	3	8	10	3	4.0	**5.10**	**3.83**
R294	661547	756197	2	8	10	2.1	3.1	**10.92**	**7.40**
R296	661690	756214	2	8	10	1.8	2.8	**12.74**	**8.19**
R298	661525	756287	2	8	10	1.2	2.2	**19.11**	**10.43**
R300	663937	755791	2	8	10	0.5	1.5	**45.87**	**15.29**
R301	663948	755890	2	8	10	1	2.0	**22.94**	**11.47**
R303	663970	756089	2	8	10	1.2	2.2	**19.11**	**10.43**
R305	663992	756288	2	8	10	1.5	2.5	**15.29**	**9.17**
R307	663916	756471	2	8	10	1	2.0	**22.94**	**11.47**
R309	663831	756652	2	8	10	1.2	2.2	**19.11**	**10.43**
R311	664098	755425	2	8	10	2.1	3.1	**10.92**	**7.40**
R314	663823	755305	2	8	10	1.7	2.7	**13.49**	**8.50**
R315	663731	755265	2	8	10	1.8	2.8	**12.74**	**8.19**
R316	663640	755225	2	8	10	2	3.0	**11.47**	**7.65**
R317	663570	755256	2	8	10	1.5	2.5	**15.29**	**9.17**
R318	663487	755224	2	8	10	1.7	2.7	**13.49**	**8.50**
R319	663429	755148	2	8	10	2	3.0	**11.47**	**7.65**
R320	663771	755283	3	8	10	1	2.0	**15.31**	**7.65**
R321	663730	755374	3	8	10	0.6	1.6	**25.51**	**9.57**
R322	663689	755465	2	8	10	1	2.0	**22.94**	**11.47**
R323	663598	755432	2	8	10	1	2.0	**22.94**	**11.47**
R324	663581	755425	2	8	10	0.8	1.8	**28.67**	**12.74**
R325	664589	754516	2	8	10	0.5	1.5	**45.87**	**15.29**
R326	664494	754548	3	8	10	2.3	3.3	**6.66**	**4.64**
R327	664411	754602	3	8	10	2.1	3.1	**7.29**	**4.94**
R330	663871	752882	2	8	10	0.8	1.8	**28.67**	**12.74**
R331	663963	752842	2	8	10	1.3	2.3	**17.64**	**9.97**
R333	664146	752761	2	8	10	1	2.0	**22.94**	**11.47**
R335	664331	752689	2	8	10	1.4	2.4	**16.38**	**9.56**
R337	664531	752678	3	8	10	1.5	2.5	**10.20**	**6.12**
R339	664731	752667	3	8	10	1.1	2.1	**13.92**	**7.29**
R341	664930	752656	2	8	10	2.7	3.7	**8.50**	**6.20**
R343	665127	752635	2	8	10	2	3.0	**11.47**	**7.65**
R344	665210	752578	2	8	10	2	3.0	**11.47**	**7.65**
R345	665293	752522	2	8	10	2.1	3.1	**10.92**	**7.40**
R347	665457	752408	2	8	10	1	2.0	**22.94**	**11.47**
R349	665622	752295	2	8	10	1.2	2.2	**19.11**	**10.43**
R350	665705	752239	2	8	10	1.6	2.6	**14.34**	**8.82**
R351	665788	752183	3	8	10	2.9	3.9	**5.28**	**3.92**
R352	665870	752127	3	8	10	2.4	3.4	**6.38**	**4.50**
R353	665953	752071	3	8	10	1.3	2.3	**11.77**	**6.66**
R354	665958	752067	2	8	10	1.5	2.5	**15.29**	**9.17**
R355	665685	751633	2	8	10	1.2	2.2	**19.11**	**10.43**
R356	665624	751554	2	8	10	1	2.0	**22.94**	**11.47**
R357	665562	751475	2	8	10	1.8	2.8	**12.74**	**8.19**
R358	665533	751437	2	8	10	1.2	2.2	**19.11**	**10.43**
R359	665278	751409	2	8	10	0.8	1.8	**28.67**	**12.74**
R366	664417	752168	3	8	10	1.5	2.5	**10.20**	**6.12**
R367	664492	752102	2	8	10	1.5	2.5	**15.29**	**9.17**
R368	664567	752035	2	8	10	0.6	1.6	**38.23**	**14.34**
R369	664638	751972	2	8	10	1.2	2.2	**19.11**	**10.43**
R371	661662	756489	2	8	10	2.5	3.5	**9.17**	**6.55**
R373	661474	756421	3	8	10	3.4	4.4	**4.50**	**3.48**
R375	661368	756384	3	8	10	1.2	2.2	**12.76**	**6.96**
R377	661976	756619	3	8	10	0.9	1.9	**17.01**	**8.06**
R379	661917	756810	3	8	10	1.5	2.5	**10.20**	**6.12**
MET1_1	663828	759073	4	8	10	0.9	1.9	**12.77**	**6.05**
MET1_3	663867	759067	4	8	10	1.4	2.4	**8.21**	**4.79**
CP1_1	664353	757837	3	8	10	2	3.0	**7.65**	**5.10**
CP1_3	664342	757787	2	8	10	1.3	2.3	**17.64**	**9.97**
CP1_5	664349	757812	2	8	10	1	2.0	**22.94**	**11.47**
CCP1_1	663854	757488	2	8	10	2	3.0	**11.47**	**7.65**

Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Undrained Analysis

Turbine No./Waypoint	Easting	Northing	Slope	Undrained shear strength	Bulk unit weight of Peat	Peat Depth	Surcharge Equivalent Placed Fill Depth (m)	Factor of Safety for Load Condition	
			β (deg)	c_u (kPa)	γ (kN/m^3)	(m)	Condition (2)	Condition (1)	Condition (2)
CCP1_3	663966	757490	3	8	10	1.8	2.8	**8.50**	**5.47**
MET2_1	661518	756595	2	8	10	2.5	3.5	**9.17**	**6.55**
MET2_3	661551	756572	2	8	10	3	4.0	**7.65**	**5.73**
CCP2_1	663467	755177	2	8	10	0.5	1.5	**45.87**	**15.29**
CCP2_2	663533	755252	2	8	10	0.9	1.9	**25.49**	**12.07**
CCP2_3	663571	755219	2	8	10	1.5	2.5	**15.29**	**9.17**
CCP2_4	663505	755144	2	8	10	1.9	2.9	**12.07**	**7.91**
CCP2_5	663517	755194	2	8	10	0.8	1.8	**28.67**	**12.74**
SUB1_1	663587	755382	2	8	10	1	2.0	**22.94**	**11.47**
SUB1_2	663685	755425	2	8	10	1.2	2.2	**19.11**	**10.43**
SUB1_4	663736	755293	2	8	10	1.5	2.5	**15.29**	**9.17**
SUB1_6	663625	755295	2	8	10	1.8	2.8	**12.74**	**8.19**
SUB1_9	663451	755343	2	8	10	1.7	2.7	**13.49**	**8.50**
SUB1_10	663815	755501	2	8	10	1.5	2.5	**15.29**	**9.17**
SUB1_11	663975	755571	2	8	10	1.9	2.9	**12.07**	**7.91**
BP1_2	661667	755996	4	8	10	0.7	1.7	**16.42**	**6.76**
BP2_3	664138	755330	4	8	10	2.7	3.7	**4.26**	**3.11**
BP3_1	664131	755390	4	8	10	1.2	2.2	**9.58**	**5.23**
BP3_2	664296	755371	4	8	10	1.4	2.4	**8.21**	**4.79**
BP3_3	664315	755307	3	8	10	1	2.0	**15.31**	**7.65**
BP3_4	664293	755235	3	8	10	1.2	2.2	**12.76**	**6.96**
BP3_5	664252	755205	3	8	10	1	2.0	**15.31**	**7.65**
BP3_5	664195	755316	4	8	10	2.1	3.1	**5.47**	**3.71**
BP3_6	664199	755355	2	8	10	0.9	1.9	**25.49**	**12.07**
BP3_7	664251	755323	3	8	10	1	2.0	**15.31**	**7.65**
BP3_8	664263	755267	3	8	10	1.9	2.9	**8.06**	**5.28**
BP4_1	664188	755215	6	8	10	2.1	3.1	**3.66**	**2.48**
BP4_2	664233	755134	4	8	10	1.5	2.5	**7.66**	**4.60**
BP4_3	664298	754980	4	8	10	1	2.0	**11.50**	**5.75**
BP4_4	664267	754886	4	8	10	1.7	2.7	**6.76**	**4.26**
BP4_5	664119	754716	3	8	10	1	2.0	**15.31**	**7.65**
BP4_6	664158	754845	3	8	10	0.6	1.6	**25.51**	**9.57**
BP4_7	664198	754953	6	8	10	0.9	1.9	**8.55**	**4.05**
BP4_8	664141	755041	6	8	10	1.9	2.9	**4.05**	**2.65**
BP4_9	664175	755114	4	8	10	2.1	3.1	**5.47**	**3.71**
BP4_10	664207	755043	2	8	10	1	2.0	**22.94**	**11.47**
BP4_11	664236	754939	2	8	10	1.2	2.2	**19.11**	**10.43**
BP4_12	664181	754808	3	8	10	2	3.0	**7.65**	**5.10**
BP5_2	665330	751430	3	8	10	2.1	3.1	**7.29**	**4.94**
CCP3_1	664599	754013	2	8	10	1.6	2.6	**14.34**	**8.82**
CCP3_2	664472	754040	2	8	10	1.2	2.2	**19.11**	**10.43**
CCP3_3	664486	754108	2	8	10	1.8	2.8	**12.74**	**8.19**
CCP3_4	664613	754082	2	8	10	1.5	2.5	**15.29**	**9.17**
CCP3_5	664542	754056	2	8	10	1.2	2.2	**19.11**	**10.43**
MET3_1	663677	752816	2	8	10	1.7	2.7	**13.49**	**8.50**
MET3_2	663661	752801	2	8	10	1.5	2.5	**15.29**	**9.17**
MET3_3	663695	752781	2	8	10	2	3.0	**11.47**	**7.65**
MET3_4	663703	752794	2	8	10	1.5	2.5	**15.29**	**9.17**
WP001	663694	757286	2	8	10	1.7	2.7	**13.49**	**8.50**
WP002	663790	757320	1	8	10	2	3.0	**22.92**	**15.28**
WP003	663920	757372	2	8	10	2.3	3.3	**9.97**	**6.95**
WP004	663980	757341	2	8	10	3.1	4.1	**7.40**	**5.59**
WP005	664008	757401	2	8	10	2.1	3.1	**10.92**	**7.40**
WP006	664230	757492	2	8	10	4.3	5.3	**5.33**	**4.33**
WP007	664303	757637	2	8	10	4.5	5.5	**5.10**	**4.17**
							Minimum =	**2.61**	**2.13**
							Maximum =	**57.34**	**16.38**
							Average =	**13.74**	**7.55**
							count	320.0	320.0
							count if >1.3	320.0	320.0

Notes:

(1) Assuming a bulk unit weight for peat of 10kN/m^3

(2) Assuming a surcharge equivalent to fill depth of 1m of peat i.e. 10kPa.

(3) Slope inclination (β) based on site readings and site contour plans.

(4) A lower bound undrained shear strength, cu for the peat of 8kPa was selected for the assessment. It should be noted that a cu of 8kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality the peat has a significantly higher undrained strength.

(5) Peat depths based on probes carried out by FT.

(6) For load conditions see report text.

Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Drained Analysis

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	Depth of In situ Peat	Friction Angle	Surcharge Equivalent Placed Fill	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	ø' (deg)	Condition (2)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
T01	2	4	10.0	10.0	2.35	25	1.0	3.4	**4.88**	**7.41**
T02	3	4	10.0	10.0	1.75	25	1.0	2.8	**4.37**	**6.02**
T03	2	4	10.0	10.0	0.85	25	1.0	1.9	**13.49**	**13.42**
T04	3	4	10.0	10.0	2.80	25	1.0	3.8	**2.73**	**4.36**
T05	2	4	10.0	10.0	4.90	25	1.0	5.9	**2.34**	**4.21**
T06	3	4	10.0	10.0	2.10	25	1.0	3.1	**3.64**	**5.34**
T07	4	4	10.0	10.0	4.40	25	1.0	5.4	**1.31**	**2.30**
T08	2	4	10.0	10.0	3.80	25	1.0	4.8	**3.02**	**5.17**
T09	2	4	10.0	10.0	2.90	25	1.0	3.9	**3.95**	**6.36**
T10	2	4	10.0	10.0	2.05	25	1.0	3.1	**5.59**	**8.14**
T11	3	4	10.0	10.0	1.1	25	1.0	2.1	**6.96**	**7.88**
T12	2	4	10.0	10.0	3.5	25	1.0	4.5	**3.28**	**5.52**
T13	2	4	10.0	10.0	2.8	25	1.0	3.8	**4.10**	**6.53**
T14	3	4	10.0	10.0	1.2	25	1.0	2.2	**6.38**	**7.52**
T15	3	4	10.0	10.0	2.6	25	1.0	3.6	**2.94**	**4.60**
T16	2	4	10.0	10.0	4.1	25	1.0	5.1	**2.80**	**4.87**
T17	4	4	10.0	10.0	0.9	25	1.0	1.9	**6.39**	**6.54**
T18	4	4	10.0	10.0	4.4	25	1.0	5.4	**1.31**	**2.30**
T19	4	4	10.0	10.0	2.8	25	1.0	3.8	**2.05**	**3.27**
T20	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
T21	3	4	10.0	10.0	0.9	25	1.0	1.9	**8.50**	**8.71**
T22	2	4	10.0	10.0	1.4	25	1.0	2.4	**8.19**	**10.34**
T23	2	4	10.0	10.0	3.1	25	1.0	4.1	**3.70**	**6.05**
T24	3	4	10.0	10.0	3.35	25	1.0	4.4	**2.28**	**3.80**
T25	2	4	10.0	10.0	3.85	25	1.0	4.9	**2.98**	**5.12**
T26	2	4	10.0	10.0	2.3	25	1.0	3.3	**4.99**	**7.52**
R7	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R9	3	4	10.0	10.0	1.1	25	1.0	2.1	**6.96**	**7.88**
R11	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R13	2	4	10.0	10.0	2.1	25	1.0	3.1	**5.46**	**8.01**
R15	2	4	10.0	10.0	2.8	25	1.0	3.8	**4.10**	**6.53**
R17	3	4	10.0	10.0	2.5	25	1.0	3.5	**3.06**	**4.73**
R19	2	4	10.0	10.0	2.1	25	1.0	3.1	**5.46**	**8.01**
R21	3	4	10.0	10.0	2.1	25	1.0	3.1	**3.64**	**5.34**
R23	3	4	10.0	10.0	2.5	25	1.0	3.5	**3.06**	**4.73**
R25	3	4	10.0	10.0	2.7	25	1.0	3.7	**2.83**	**4.47**
R27	3	4	10.0	10.0	2.2	25	1.0	3.2	**3.48**	**5.17**
R29	4	4	10.0	10.0	2.6	25	1.0	3.6	**2.21**	**3.45**
R31	4	4	10.0	10.0	2.5	25	1.0	3.5	**2.30**	**3.55**
R33	4	4	10.0	10.0	0.8	25	1.0	1.8	**7.19**	**6.90**
R35	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R37	2	4	10.0	10.0	2.8	25	1.0	3.8	**4.10**	**6.53**
R39	2	4	10.0	10.0	0.7	25	1.0	1.7	**16.38**	**14.60**
R41	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R43	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R45	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R47	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R49	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R50	2	4	10.0	10.0	2.6	25	1.0	3.6	**4.41**	**6.89**
R52	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R54	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R56	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R58	3	4	10.0	10.0	1.3	25	1.0	2.3	**5.89**	**7.20**
R60	3	4	10.0	10.0	0.5	25	1.0	1.5	**15.31**	**11.03**
R62	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
R64	3	4	10.0	10.0	1.2	25	1.0	2.2	**6.38**	**7.52**
R66	4	4	10.0	10.0	1.5	25	1.0	2.5	**3.83**	**4.97**
R68	4	4	10.0	10.0	1.8	25	1.0	2.8	**3.19**	**4.43**
R70	2	4	10.0	10.0	0.5	25	1.0	1.5	**22.94**	**16.55**
R71	2	4	10.0	10.0	1.7	25	1.0	2.7	**6.75**	**9.19**
R72	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R73	3	4	10.0	10.0	1.8	25	1.0	2.8	**4.25**	**5.91**
R74	3	4	10.0	10.0	2.2	25	1.0	3.2	**3.48**	**5.17**
R75	2	4	10.0	10.0	0.4	25	1.0	1.4	**28.67**	**17.73**
R76	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R77	4	4	10.0	10.0	1.5	25	1.0	2.5	**3.83**	**4.97**
R78	4	4	10.0	10.0	1.8	25	1.0	2.8	**3.19**	**4.43**
R79	2	4	10.0	10.0	2.4	25	1.0	3.4	**4.78**	**7.30**
R80	3	4	10.0	10.0	3.4	25	1.0	4.4	**2.25**	**3.76**
R81	3	4	10.0	10.0	3	25	1.0	4.0	**2.55**	**4.14**
R82	3	4	10.0	10.0	2.5	25	1.0	3.5	**3.06**	**4.73**
R83	4	4	10.0	10.0	2.5	25	1.0	3.5	**2.30**	**3.55**
R84	4	4	10.0	10.0	3	25	1.0	4.0	**1.92**	**3.10**
R85	4	4	10.0	10.0	2.2	25	1.0	3.2	**2.61**	**3.88**
R86	4	4	10.0	10.0	2	25	1.0	3.0	**2.87**	**4.14**
R90	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R91	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R92	2	4	10.0	10.0	2.1	25	1.0	3.1	**5.46**	**8.01**
R93	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R94	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R95	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R96	3	4	10.0	10.0	2.8	25	1.0	3.8	**2.73**	**4.36**
R97	2	4	10.0	10.0	2.4	25	1.0	3.4	**4.78**	**7.30**
R98	3	4	10.0	10.0	2.6	25	1.0	3.6	**2.94**	**4.60**
R99	4	4	10.0	10.0	2.8	25	1.0	3.8	**2.05**	**3.27**
R100	4	4	10.0	10.0	2.4	25	1.0	3.4	**2.40**	**3.65**
R101	3	4	10.0	10.0	0.9	25	1.0	1.9	**8.50**	**8.71**
R102	3	4	10.0	10.0	1.2	25	1.0	2.2	**6.38**	**7.52**
R103	3	4	10.0	10.0	0.4	25	1.0	1.4	**19.13**	**11.82**
R104	2	4	10.0	10.0	0.9	25	1.0	1.9	**12.74**	**13.06**
R105	2	4	10.0	10.0	0.6	25	1.0	1.6	**19.11**	**15.51**

Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Drained Analysis

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	Depth of In situ Peat	Friction Angle	Surcharge Equivalent Placed Fill	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	ø' (deg)	Condition (2)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
R106	2	4	10.0	10.0	0.6	25	1.0	1.6	**19.11**	**15.51**
R107	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
R108	3	4	10.0	10.0	1.7	25	1.0	2.7	**4.50**	**6.13**
R109	4	4	10.0	10.0	1.7	25	1.0	2.7	**3.38**	**4.60**
R110	4	4	10.0	10.0	1.2	25	1.0	2.2	**4.79**	**5.64**
R111	4	4	10.0	10.0	1.8	25	1.0	2.8	**3.19**	**4.43**
R112	2	4	10.0	10.0	1.4	25	1.0	2.4	**8.19**	**10.34**
R113	2	4	10.0	10.0	1.3	25	1.0	2.3	**8.82**	**10.79**
R114	2	4	10.0	10.0	2.3	25	1.0	3.3	**4.99**	**7.52**
R115	4	4	10.0	10.0	0.8	25	1.0	1.8	**7.19**	**6.90**
R116	4	4	10.0	10.0	1.3	25	1.0	2.3	**4.42**	**5.40**
R117	4	4	10.0	10.0	1.2	25	1.0	2.2	**4.79**	**5.64**
R118	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R119	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R120	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
R121	3	4	10.0	10.0	3.3	25	1.0	4.3	**2.32**	**3.85**
R122	4	4	10.0	10.0	0.9	25	1.0	1.9	**6.39**	**6.54**
R123	4	4	10.0	10.0	2	25	1.0	3.0	**2.87**	**4.14**
R124	4	4	10.0	10.0	2.2	25	1.0	3.2	**2.61**	**3.88**
R125	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R126	3	4	10.0	10.0	1.8	25	1.0	2.8	**4.25**	**5.91**
R127	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
R128	3	4	10.0	10.0	1.1	25	1.0	2.1	**6.96**	**7.88**
R129	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R130	2	4	10.0	10.0	1.3	25	1.0	2.3	**8.82**	**10.79**
R131	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R132	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R133	3	4	10.0	10.0	1.7	25	1.0	2.7	**4.50**	**6.13**
R134	3	4	10.0	10.0	1.8	25	1.0	2.8	**4.25**	**5.91**
R135	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R136	2	4	10.0	10.0	1.9	25	1.0	2.9	**6.04**	**8.56**
R137	2	4	10.0	10.0	1.3	25	1.0	2.3	**8.82**	**10.79**
R138	2	4	10.0	10.0	1.3	25	1.0	2.3	**8.82**	**10.79**
R139	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R140	2	4	10.0	10.0	1.7	25	1.0	2.7	**6.75**	**9.19**
R141	2	4	10.0	10.0	1.7	25	1.0	2.7	**6.75**	**9.19**
R143	3	4	10.0	10.0	2.4	25	1.0	3.4	**3.19**	**4.87**
R145	2	4	10.0	10.0	2.1	25	1.0	3.1	**5.46**	**8.01**
R147	2	4	10.0	10.0	0.8	25	1.0	1.8	**14.34**	**13.79**
R149	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R151	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R152	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R153	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R154	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R156	2	4	10.0	10.0	3.1	25	1.0	4.1	**3.70**	**6.05**
R158	3	4	10.0	10.0	1.6	25	1.0	2.6	**4.78**	**6.37**
R159	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R161	3	4	10.0	10.0	1.9	25	1.0	2.9	**4.03**	**5.71**
R163	5	4	10.0	10.0	1	25	1.0	2.0	**4.61**	**4.97**
R165	2	4	10.0	10.0	1.1	25	1.0	2.1	**10.43**	**11.82**
R166	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R168	3	4	10.0	10.0	2	25	1.0	3.0	**3.83**	**5.52**
R170	3	4	10.0	10.0	2	25	1.0	3.0	**3.83**	**5.52**
R171	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
R172	3	4	10.0	10.0	1.2	25	1.0	2.2	**6.38**	**7.52**
R174	4	4	10.0	10.0	1.2	25	1.0	2.2	**4.79**	**5.64**
R175	4	4	10.0	10.0	0.6	25	1.0	1.6	**9.58**	**7.76**
R176	4	4	10.0	10.0	1.5	25	1.0	2.5	**3.83**	**4.97**
R178	2	4	10.0	10.0	1.1	25	1.0	2.1	**10.43**	**11.82**
R180	3	4	10.0	10.0	1.3	25	1.0	2.3	**5.89**	**7.20**
R182	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R183	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R185	2	4	10.0	10.0	0.6	25	1.0	1.6	**19.11**	**15.51**
R187	2	4	10.0	10.0	1.7	25	1.0	2.7	**6.75**	**9.19**
R189	2	4	10.0	10.0	1.3	25	1.0	2.3	**8.82**	**10.79**
R191	2	4	10.0	10.0	0.6	25	1.0	1.6	**19.11**	**15.51**
R193	3	4	10.0	10.0	2	25	1.0	3.0	**3.83**	**5.52**
R195	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R198	3	4	10.0	10.0	4.2	25	1.0	5.2	**1.82**	**3.18**
R200	3	4	10.0	10.0	2.1	25	1.0	3.1	**3.64**	**5.34**
R202	3	4	10.0	10.0	2.4	25	1.0	3.4	**3.19**	**4.87**
R205	2	4	10.0	10.0	1.1	25	1.0	2.1	**10.43**	**11.82**
R207	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R209	2	4	10.0	10.0	1.3	25	1.0	2.3	**8.82**	**10.79**
R211	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R213	2	4	10.0	10.0	1.4	25	1.0	2.4	**8.19**	**10.34**
R215	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R216	2	4	10.0	10.0	0.9	25	1.0	1.9	**12.74**	**13.06**
R218	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R220	2	4	10.0	10.0	0.9	25	1.0	1.9	**12.74**	**13.06**
R222	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R224	3	4	10.0	10.0	1.3	25	1.0	2.3	**5.89**	**7.20**
R226	3	4	10.0	10.0	1.2	25	1.0	2.2	**6.38**	**7.52**
R228	3	4	10.0	10.0	0.7	25	1.0	1.7	**10.93**	**9.74**
R230	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
R232	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R234	3	4	10.0	10.0	1.2	25	1.0	2.2	**6.38**	**7.52**
R236	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
R238	2	4	10.0	10.0	1.6	25	1.0	2.6	**7.17**	**9.55**
R240	2	4	10.0	10.0	1.1	25	1.0	2.1	**10.43**	**11.82**
R242	2	4	10.0	10.0	0.6	25	1.0	1.6	**19.11**	**15.51**
R244	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R246	2	4	10.0	10.0	1.1	25	1.0	2.1	**10.43**	**11.82**

Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Drained Analysis

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	Depth of In situ Peat	Friction Angle	Surcharge Equivalent Placed Fill	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	ø' (deg)	Condition (2)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
R248	2	4	10.0	10.0	1.4	25	1.0	2.4	**8.19**	**10.34**
R250	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R253	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R255	3	4	10.0	10.0	1.1	25	1.0	2.1	**6.96**	**7.88**
R257	3	4	10.0	10.0	2	25	1.0	3.0	**3.83**	**5.52**
R259	4	4	10.0	10.0	2.5	25	1.0	3.5	**2.30**	**3.55**
R261	4	4	10.0	10.0	2	25	1.0	3.0	**2.87**	**4.14**
R263	4	4	10.0	10.0	1.5	25	1.0	2.5	**3.83**	**4.97**
R265	3	4	10.0	10.0	2.1	25	1.0	3.1	**3.64**	**5.34**
R267	3	4	10.0	10.0	1.4	25	1.0	2.4	**5.47**	**6.90**
R269	3	4	10.0	10.0	1.9	25	1.0	2.9	**4.03**	**5.71**
R270	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R272	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R274	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R275	2	4	10.0	10.0	2.1	25	1.0	3.1	**5.46**	**8.01**
R277	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R284	3	4	10.0	10.0	2.1	25	1.0	3.1	**3.64**	**5.34**
R286	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R288	3	4	10.0	10.0	3.2	25	1.0	4.2	**2.39**	**3.94**
R290	3	4	10.0	10.0	3	25	1.0	4.0	**2.55**	**4.14**
R294	2	4	10.0	10.0	2.1	25	1.0	3.1	**5.46**	**8.01**
R296	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R298	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R300	2	4	10.0	10.0	0.5	25	1.0	1.5	**22.94**	**16.55**
R301	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R303	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R305	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R307	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R309	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R311	2	4	10.0	10.0	2.1	25	1.0	3.1	**5.46**	**8.01**
R314	2	4	10.0	10.0	1.7	25	1.0	2.7	**6.75**	**9.19**
R315	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R316	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R317	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R318	2	4	10.0	10.0	1.7	25	1.0	2.7	**6.75**	**9.19**
R319	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R320	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
R321	3	4	10.0	10.0	0.6	25	1.0	1.6	**12.76**	**10.34**
R322	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R323	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R324	2	4	10.0	10.0	0.8	25	1.0	1.8	**14.34**	**13.79**
R325	2	4	10.0	10.0	0.5	25	1.0	1.5	**22.94**	**16.55**
R326	3	4	10.0	10.0	2.3	25	1.0	3.3	**3.33**	**5.02**
R327	3	4	10.0	10.0	2.1	25	1.0	3.1	**3.64**	**5.34**
R330	2	4	10.0	10.0	0.8	25	1.0	1.8	**14.34**	**13.79**
R331	2	4	10.0	10.0	1.3	25	1.0	2.3	**8.82**	**10.79**
R333	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R335	2	4	10.0	10.0	1.4	25	1.0	2.4	**8.19**	**10.34**
R337	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R339	3	4	10.0	10.0	1.1	25	1.0	2.1	**6.96**	**7.88**
R341	2	4	10.0	10.0	2.7	25	1.0	3.7	**4.25**	**6.71**
R343	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R344	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
R345	2	4	10.0	10.0	2.1	25	1.0	3.1	**5.46**	**8.01**
R347	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R349	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R350	2	4	10.0	10.0	1.6	25	1.0	2.6	**7.17**	**9.55**
R351	3	4	10.0	10.0	2.9	25	1.0	3.9	**2.64**	**4.24**
R352	3	4	10.0	10.0	2.4	25	1.0	3.4	**3.19**	**4.87**
R353	3	4	10.0	10.0	1.3	25	1.0	2.3	**5.89**	**7.20**
R354	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R355	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R356	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
R357	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
R358	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R359	2	4	10.0	10.0	0.8	25	1.0	1.8	**14.34**	**13.79**
R366	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
R367	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
R368	2	4	10.0	10.0	0.6	25	1.0	1.6	**19.11**	**15.51**
R369	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
R371	2	4	10.0	10.0	2.5	25	1.0	3.5	**4.59**	**7.09**
R373	3	4	10.0	10.0	3.4	25	1.0	4.4	**2.25**	**3.76**
R375	3	4	10.0	10.0	1.2	25	1.0	2.2	**6.38**	**7.52**
R377	3	4	10.0	10.0	0.9	25	1.0	1.9	**8.50**	**8.71**
R379	3	4	10.0	10.0	1.5	25	1.0	2.5	**5.10**	**6.62**
MET1_1	4	4	10.0	10.0	0.9	25	1.0	1.9	**6.39**	**6.54**
MET1_3	4	4	10.0	10.0	1.4	25	1.0	2.4	**4.11**	**5.17**
CP1_1	3	4	10.0	10.0	2	25	1.0	3.0	**3.83**	**5.52**
CP1_3	2	4	10.0	10.0	1.3	25	1.0	2.3	**8.82**	**10.79**
CP1_5	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
CCP1_1	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
CCP1_3	3	4	10.0	10.0	1.8	25	1.0	2.8	**4.25**	**5.91**
MET2_1	2	4	10.0	10.0	2.5	25	1.0	3.5	**4.59**	**7.09**
MET2_3	2	4	10.0	10.0	3	25	1.0	4.0	**3.82**	**6.21**
CCP2_1	2	4	10.0	10.0	0.5	25	1.0	1.5	**22.94**	**16.55**
CCP2_2	2	4	10.0	10.0	0.9	25	1.0	1.9	**12.74**	**13.06**
CCP2_3	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
CCP2_4	2	4	10.0	10.0	1.9	25	1.0	2.9	**6.04**	**8.56**
CCP2_5	2	4	10.0	10.0	0.8	25	1.0	1.8	**14.34**	**13.79**
SUB1_1	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
SUB1_2	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
SUB1_4	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**

Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Drained Analysis

Turbine No./Waypoint	Slope	Design c'	Bulk unit weight of Peat	Unit weight of Water	Depth of In situ Peat	Friction Angle	Surcharge Equivalent Placed Fill	Equivalent Total Depth of Peat (m)	Factor of Safety for Load Condition	
	α (deg)	c' (kPa)	γ (kN/m^3)	γ_w (kN/m^3)	(m)	ø' (deg)	Condition (2)	Condition (2)	Condition (1)	Condition (2)
									100% Water	100% Water
SUB1_6	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
SUB1_9	2	4	10.0	10.0	1.7	25	1.0	2.7	**6.75**	**9.19**
SUB1_10	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
SUB1_11	2	4	10.0	10.0	1.9	25	1.0	2.9	**6.04**	**8.56**
BP1_2	4	4	10.0	10.0	0.7	25	1.0	1.7	**8.21**	**7.30**
BP2_3	4	4	10.0	10.0	2.7	25	1.0	3.7	**2.13**	**3.36**
BP3_1	4	4	10.0	10.0	1.2	25	1.0	2.2	**4.79**	**5.64**
BP3_2	4	4	10.0	10.0	1.4	25	1.0	2.4	**4.11**	**5.17**
BP3_3	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
BP3_4	3	4	10.0	10.0	1.2	25	1.0	2.2	**6.38**	**7.52**
BP3_5	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
BP3_5	4	4	10.0	10.0	2.1	25	1.0	3.1	**2.74**	**4.01**
BP3_6	2	4	10.0	10.0	0.9	25	1.0	1.9	**12.74**	**13.06**
BP3_7	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
BP3_8	3	4	10.0	10.0	1.9	25	1.0	2.9	**4.03**	**5.71**
BP4_1	6	4	10.0	10.0	2.1	25	1.0	3.1	**1.83**	**2.67**
BP4_2	4	4	10.0	10.0	1.5	25	1.0	2.5	**3.83**	**4.97**
BP4_3	4	4	10.0	10.0	1	25	1.0	2.0	**5.75**	**6.21**
BP4_4	4	4	10.0	10.0	1.7	25	1.0	2.7	**3.38**	**4.60**
BP4_5	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
BP4_6	3	4	10.0	10.0	0.6	25	1.0	1.6	**12.76**	**10.34**
BP4_7	6	4	10.0	10.0	0.9	25	1.0	1.9	**4.28**	**4.36**
BP4_8	6	4	10.0	10.0	1.9	25	1.0	2.9	**2.03**	**2.86**
BP4_9	4	4	10.0	10.0	2.1	25	1.0	3.1	**2.74**	**4.01**
BP4_10	2	4	10.0	10.0	1	25	1.0	2.0	**11.47**	**12.41**
BP4_11	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
BP4_12	3	4	10.0	10.0	1	25	1.0	2.0	**7.65**	**8.28**
BP5_2	3	4	10.0	10.0	2.1	25	1.0	3.1	**3.64**	**5.34**
CCP3_1	2	4	10.0	10.0	1.6	25	1.0	2.6	**7.17**	**9.55**
CCP3_2	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
CCP3_3	2	4	10.0	10.0	1.8	25	1.0	2.8	**6.37**	**8.86**
CCP3_4	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
CCP3_5	2	4	10.0	10.0	1.2	25	1.0	2.2	**9.56**	**11.28**
MET3_1	2	4	10.0	10.0	1.7	25	1.0	2.7	**6.75**	**9.19**
MET3_2	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
MET3_3	2	4	10.0	10.0	2	25	1.0	3.0	**5.73**	**8.27**
MET3_4	2	4	10.0	10.0	1.5	25	1.0	2.5	**7.65**	**9.93**
WP001	2	4	10.0	10.0	1.7	25	1.0	2.7	**6.75**	**9.19**
WP002	1	4	10.0	10.0	2	25	1.0	3.0	**11.46**	**16.55**
WP003	2	4	10.0	10.0	2.3	25	1.0	3.3	**4.99**	**7.52**
WP004	2	4	10.0	10.0	3.1	25	1.0	4.1	**3.70**	**6.05**
WP005	2	4	10.0	10.0	2.1	25	1.0	3.1	**5.46**	**8.01**
WP006	2	4	10.0	10.0	4.3	25	1.0	5.3	**2.67**	**4.68**
WP007	2	4	10.0	10.0	4.5	25	1.0	5.5	**2.55**	**4.51**
								Minimum =	**1.31**	**2.30**
								Maximum =	**28.67**	**17.73**
								Average =	**6.88**	**8.18**
								count	**320.00**	**320.00**
								count if >1.3	320.0	320.0

Notes:

(1) Assuming a bulk unit weight of peat of 10 (kN/m^3)
(2) Assuming a surcharge equivalent to fill depth of 1.0m.
(3) Slope inclination (β) based on site readings and contour survey plans of site.
(4) FoS is based on slope inclination and shear test results obtained from published data.
(5) Peat depths based on probes carried out by FT.
(6) For load conditions see Report text.
(7) Minimum acceptable factor of safety required of 1.3 for first-time failures based on BS: 6031:1981 Code of practice for Earthworks.

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APPENDIX D

Methodology for Peat Stability Risk Assessment

Methodology for Peat Stability Risk Assessment

A peat stability risk assessment was carried out for each of the main infrastructure elements at the proposed wind farm development. This approach takes into account guidelines for geotechnical/peat stability risk assessments as given in PLHRAG (2nd Edition, 2017) and MacCulloch (2005). The degree of risk is determined as a Risk Rating (R), which is the product of probability (P) and impact (I). How these factors are determined and applied in the analysis is described below.

The main approaches for assessing peat stability include the following:

(a) Geomorphological

(b) Qualitative (judgement)

(c) Index/Probabilistic (probability)

(d) Deterministic (factor of safety)

Approaches (a) to (c) listed above would be considered subjective and do not provide a definitive indication of stability; in addition, a high level of judgement/experience is required which makes it difficult to relate the findings to real conditions. FT apply a more objective approach, the deterministic approach. As part of FT's deterministic approach, a qualitative risk assessment is also carried out taking into account qualitative factors, which cannot necessarily be quantified.

Probability

The likelihood of a peat failure occurring was assessed based on the results of both the quantitative results of stability calculations (deterministic approach using factors of safety) and the assessment of the severity of several qualitative factors which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability.

The qualitative factors used in the risk assessment are outlined in Table A and have been compiled based on FT's experience of assessments and construction in peat land sites and peat failures throughout Ireland and the UK.

Table A: Qualitative Factors used to Assess Potential for Peat Failure

Qualitative Factor	Type of Feature/Indicator for each Qualitative Factor (1)	Explanation/Description of Qualitative Factor
Evidence of sub peat water flow	No	Based on site walkover observations. Sub peat water flow generally occurs in the form of natural piping at the base of peat. Where there is a constriction or blockage in natural pipes a build-up of water can occur at the base of the peat causing a reduction in effective stress at the base of the peat resulting in failure; this is particularly critical during periods of intense rainfall.
	Possibly	
	Probably	
	Yes	

Qualitative Factor	Type of Feature/Indicator for each Qualitative Factor [1]	Explanation/Description of Qualitative Factor
Evidence of surface water flow	Dry	Based on site walkover observations. The presence of surface water flow indicates if peat in an area is well drained or saturated and if any additional loading from the ponding of surface water onto the peat is likely.
	Localised/Flowing in drains	
	Ponded in drains	
	Springs/surface water	
Evidence of previous failures/slips	No	Based on site walkover observations. The presence of clustering of relict failures may indicate that particular pre-existing site conditions predispose a site to failure.
	In general area	
	On site	
	Within 500m of location	
Type of vegetation	Grass/Crops	Based on site walkover observations. The type of vegetation present indicates if peat in an area is well drained, saturated, etc. Vegetation that indicates wetter ground may also indicate softer underlying peat deposits.
	Improved Grass/Dry Heather	
	Wet Grassland/Juncus (Rushes)	
	Wetlands Sphagnum (Peat moss)	
General slope characteristics upslope/downslope from infrastructure location	Concave	Based on site walkover observations. Slope morphology in the area of the infrastructure location is an important factor. A number of recorded peat failures have occurred in close proximity to a convex break in slope.
	Planar to concave	
	Planar to convex	
	Convex	
Evidence of very soft/soft clay at base of peat	No	Based on inspection of exposures in general area from site walkover. Several reported peat failures identify the presence of a weak layer at the base of the peat along which shear failure has occurred.
	Yes	
Evidence of mechanically cut peat	No	Based on site walkover observations. Mechanically cut peat typically cut using a ‘sausage’ machine to extract

Qualitative Factor	Type of Feature/Indicator for each Qualitative Factor (1)	Explanation/Description of Qualitative Factor
	Yes	peat for harvesting. Areas which have been cut in this manner have been linked to peat instability. The mechanical cuts can notably reduce the intrinsic strength of the peat and also allow ingress of rainfall/surface water.
Evidence of quaking or buoyant peat	No	Based on site walkover observations. Quaking/buoyant peat is indicative of highly saturated peat, which would generally be considered to have a low strength. Quaking peat is a feature on sites that have been previously linked with peat instability.
	Yes	
Evidence of bog pools	No	Based on site walkover observations. Bog pools are generally an indicator of areas of weak, saturated peat. Commonly where there are open areas of water within peat these can be interconnected, with the result that there may be sub-surface bodies of water. The presence of bog pools have been previously linked with peat instability.
	Yes	
Other	Varies	In addition to the above features/ indicators and based on site recordings the following are some of the features which may be identified: Excessively deep peat, weak peat, overly steep slope angles, etc.

Note (1) The list of features/indicators for each qualitative factor are given in increasing order of probability of leading to peat instability/failure.

It should be noted that the presence of one of the qualitative factors alone from Table A is unlikely to lead to peat instability/failure. Peat instability/failure at a site is generally the combination of a number of these factors occurring at the same time at a particular location. The probability rating assigned to the quantitative and qualitative factors is judged on a 5-point scale from 1 (indicating negligible or no probability of failure) to 5 (indicating a very likely failure), as outlined in Table B.

Table B: Probability Scale

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

Scale	Likelihood of Qualitative Factor leading to Peat Failure	Probability of Failure
1	Negligible/None	Least
2	Unlikely	
3	Probable	
4	Likely	
5	Very Likely	Greatest

Impact

The severity of the risk is also assessed qualitatively in terms of impact. The impact of a peat failure on the environment within and beyond the immediate wind farm site is assessed based on the potential travel distance of a peat failure. Where a peat failure enters a watercourse, it can travel a considerable distance downstream. Therefore, the proximity of a potential peat failure to a drainage course is a significant indicator of the likely potential impact.

The risk is determined based on the combination of hazard and impact. A qualitative scale has been derived for the impact of the hazard based on distance of infrastructure element to a watercourse (Table C).

The location of watercourses is based on topographic maps and supplemented by site observations from walkover survey. Note that not all watercourses are shown on maps.

Table C: Impact Scale

Scale	Criteria	Impact
1	Proposed infrastructure element greater than 150m of watercourse	Negligible/None
2	Proposed infrastructure element within 150 to 101m of watercourse	Low
3	Proposed infrastructure element within 100 to 51m of watercourse	Medium

4	Proposed infrastructure element within 50 m of watercourse	High
5	Proposed infrastructure element within 50 m of watercourse, in an environmentally sensitive area	Extremely High

Risk Rating

The degree of risk is determined as the product of probability (P) and impact (I), which gives the Risk Rating (R) as follows:

The Risk Rating is calculated from: R = P x I

Due to the 5-point scales used to assess Probability and Impact, the Risk Rating can range from 1 to 25 as shown in Table D.

Table D: Qualitative Risk Rating

		Probability				
		1	**2**	**3**	**4**	**5**
Impact	**5**	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5

Risk Rating & Control Measures	
17 to 25	High: avoid working in area or significant control measures required
11 to 16	Medium: notable control measures required
5 to 10	Low: only routine control measures required
1 to 4	Negligible: none or only routine control measures required

The risk rating is calculated individually for each contributory factor. Control measures are required to reduce the risk to at least a 'Low' risk rating. The control measures in response to the qualitative risk ratings are included in the peat stability risk registers for each main infrastructure element in Appendix B.

The risk rating is calculated individually for each contributory factor. Control measures are required to reduce the risk to at least a 'Low' risk rating

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

APPENDIX E

Borrow Pit Ground Investigation, FT, 2020

Trial Pit Log

Trialpit No
P1 TP-A
Sheet 1 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 663962.00 - 758684.00 Level:	Date 17/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.50	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Fibrous soft PEAT with branches and roots.
				2.80			Soft light grey slightly sandy, slightly gravelly CLAY. Sand is fine-grained and gravels are sub-rounded.
▼				4.00			Firm grey slightly gravelly, sandy CLAY with cobbles. Cobbles and gravels are sub-rounded.
							Continued on next sheet

1 2 3 4 5

Remarks: Trial pit moved to area with suspected shallow bedrock (according to machine operator)

Stability: Pit began to collapse at 5.5m

Trial Pit Log

Trialpit No
P1 TP-A
Sheet 2 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 663962.00 - 758684.00 Level:	Date 17/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.50	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				5.50			End of pit at 5.50 m

6
7
8
9
10

Remarks: Trial pit moved to area with suspected shallow bedrock (according to machine operator)

Stability: Pit began to collapse at 5.5m

Trial Pit Log

Trialpit No
P1 TP-B
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 665121.00 - 758495.00 Level:	Date 17/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.00	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			Firm dark brown fibrous PEAT.
							Soft light brown, amorphous PEAT with branches and roots (moss peat).
▼				2.80			Soft light grey sandy gravelly CLAY. Sand is coarse grained and gravel is sub-rounded.
	3.50	B					
				5.00			End of pit at 5.00 m

Remarks:

Stability: Walls began to collapse at 5m.

Trial Pit Log

Trialpit No
P1 TP-C
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 665735.00 - 759326.00 Level:	Date 17/08/2020
Location: Co. Meath		Dimensions (m): Depth 4.70	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Soft light brown, amorphous PEAT (moss peat)
				3.40			Firm grey sandy, gravelly SILT with cobbles. Medium grained sand with sub-rounded gravels and cobbles.
▼				3.60			Grey sandy silty GRAVEL with cobbles. Coarse grained sand with sub-rounded gravel and cobbles.
				4.70			End of pit at 4.70 m

1 2 3 4 5

Remarks:

Stability: Instability of walls at 4.7m

Trial Pit Log

Trialpit No
P1 TP-D
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 665950.00 - 752542.00 Level:	Date 20/08/2020
Location: Co. Meath		Dimensions (m): Depth 4.00	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Soft dark brown fibrous PEAT
							Soft light brown amorphous PEAT (moss peat)
				3.00			Firm grey slightly gravelly SILT.
▼				3.30			Grey coarse grained SAND.
				4.00			End of pit at 4.00 m

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 4m

Trial Pit Log

Trialpit No
P1 TP-E
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 665431.00 - 751473.00 Level:	Date 21/08/2020
Location: Co. Meath		Dimensions (m): Depth 4.50	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			Soft dark brown fibrous PEAT.
							Soft light brown PEAT (moss peat)
				4.00			Soft grey slightly sandy SILT.
				4.50			End of pit at 4.50 m

1
2
3
4
5

Remarks: Pit dry

Stability: Pit stable

Trial Pit Log

Trialpit No
P1 TP-F
Sheet 1 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661548.00 - 757078.00 Level:	Date 19/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.20	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Firm, dark brown fibrous PEAT.
				0.30			Soft, light brown amorphous PEAT (moss peat)
				4.40			Slightly gravelly, silty SAND. Gravel is sub-rounded and sand is medium grained.
▼							Continued on next sheet

1
2
3
4
5

Remarks:

Stability: Instability of walls at 5.2m

Trial Pit Log

Trialpit No
P1 TP-F
Sheet 2 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661548.00 - 757078.00 Level:	Date 19/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.20	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				5.20			End of pit at 5.20 m

6
7
8
9
10

Remarks:

Stability: Instability of walls at 5.2m

Trial Pit Log

Trialpit No
P1 TP-G
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 659961.00 - 756843.00 Level:	Date 19/08/2020
Location: Co. Meath		Dimensions (m): Depth 4.40	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Soft light brown amorphous PEAT (moss peat)
				2.60			Soft grey slightly gravelly CLAY. Gravel is sub-rounded.
				3.40			Soft grey slightly gravelly, slightly cobbly CLAY. Gravel and cobbles are sub-rounded.
				4.40			End of pit at 4.40 m

1 2 3 4 5

Remarks: Pit dry

Stability: Instability of trial pit walls at 4.4m

Trial Pit Log

Trialpit No
P1 TP-H
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 663431.00 - 757512.00 Level:	Date 19/08/2020
Location: Co. Meath		Dimensions (m): Depth 4.00	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Firm dark brown fibrous PEAT.
				1.90			Soft light brown amorphous PEAT (moss peat).
				4.00			Firm grey slightly gravelly SILT with cobbles. Gravel is sub-rounded and cobbles are angular.
							End of pit at 4.00 m

1
2
3
4
5

Remarks: Pit dry

Stability: Instability of trial pit walls at 4m

Trial Pit Log

Trialpit No
P1 TP-I
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 664636.00 - 752049.00 Level:	Date 21/08/2020
Location: Co. Meath		Dimensions (m): Depth 4.20	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Soft light brown amorphous PEAT (moss peat)
▼				3.00			Soft grey slightly gravelly SILT.
				4.20			End of pit at 4.20 m

1
2
3
4
5

Remarks:

Stability: Instability of trial pit walls at 4.2m

Trial Pit Log

Trialpit No
P1 TP-J
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 663138.00 - 756984.00 Level:	Date 19/08/2020
Location: Co. Meath		Dimensions (m): Depth 4.60	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Firm dark brown slightly fibrous PEAT.
				0.30			Soft light brown amorphous PEAT (moss peat). Branches placed within this layer.
				2.00			Soft grey sandy, slightly gravelly SILT. Sand is medium grained and gravel is sub-rounded.
				2.50			Grey slightly gravelly SAND with cobbles. Sand is coarse grained with sub-rounded gravel and cobbles.
▼				4.60			End of pit at 4.60 m

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 4.6m

Trial Pit Log

Trialpit No
P1 TP-K
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 664120.00 - 755361.00 Level:	Date 19/08/2020
Location: Co. Meath		Dimensions (m): Depth 4.00	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Firm dark brown fibrous PEAT.
				0.50			Soft light brown amorphous PEAT (moss peat)
				4.00			Firm grey/ brown gravelly SILT with cobbles. Gravel is sub-rounded and cobbles are sub-angular End of pit at 4.00 m

1
2
3
4
5

Remarks: Pit dry

Stability: Pit stable

Trial Pit Log

Trialpit No
P1 TP-L
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 664194.00 - 755179.00 Level:	Date 20/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.00	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Soft dark brown fibrous PEAT.
							Firm grey/ brown sandy, slightly gravelly, slightly cobbly SILT. Coarse grained sand with sub-rounded gravel and cobbles.
				2.00			Grey sandy silty GRAVEL with cobbles. Sand is coarse grained and gravel and cobbles are sub-rounded.
	3.00	B					
				5.00			End of pit at 5.00 m

Remarks: Pit dry

Stability: Pit stable

Trial Pit Log

Trialpit No
P1 TP-M
Sheet 1 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 664207.00 - 755015.00 Level:	Date 20/08/2020
Location: Co. Meath		Dimensions (m): Depth 6.00	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			Soft dark brown PEAT.
							Grey sandy silty GRAVEL with cobbles and boulders. Sand is medium grained and gravel and cobbles are sub-rounded. Boulders are sub-angular.
				2.00			Grey slightly cobbly SAND. Cobbles are sub-rounded and sand is coarse grained.
							Continued on next sheet

1
2
3
4
5

Remarks: Pit dry

Stability: Pit stable

Trial Pit Log

Trialpit No
P1 TP-M
Sheet 2 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 664207.00 - 755015.00 Level:	Date 20/08/2020
Location: Co. Meath		Dimensions (m): Depth 6.00	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				6.00			End of pit at 6.00 m

6
7
8
9
10

Remarks: Pit dry

Stability: Pit stable

Trial Pit Log

Trialpit No
P1 TP-N
Sheet 1 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 664173.00 - 754794.00 Level:	Date 20/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.30	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			Firm dark brown fibrous PEAT.
				0.80			Soft brown/ grey gravelly SILT. Gravel is sub-rounded.
							Firm grey silty, sandy GRAVEL with boulders. Sand is medium grained, gravel is sub-rounded and boulders are sub-angular.
							Continued on next sheet

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 5.3m

Trial Pit Log

Trialpit No
P1 TP-N
Sheet 2 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 664173.00 - 754794.00 Level:	Date 20/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.30	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				5.30			End of pit at 5.30 m

6
7
8
9
10

Remarks:

Stability: Instability of trial pit walls at 5.3m

Trial Pit Log

Trialpit No **P1 TP-SUB1**
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 664003.00 - 755502.00 Level:	Date 20/08/2020
Location: Co. Meath		Dimensions (m): Depth 3.40	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Soft light brown amorphous PEAT (moss peat)
				2.90			Soft grey slightly gravelly SILT. Gravel is sub-rounded
▼				3.40			End of pit at 3.40 m

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 3.4m

Trial Pit Log

Trialpit No **P1 TP-SUB2**
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 663822.00 - 755369.00 Level:	Date 20/08/2020
Location: Co. Meath		Dimensions (m): Depth 3.40	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Soft light brown amorphous PEAT (moss peat)
				2.90			Soft grey gravelly SILT with cobbles. Gravel and cobbles are sub-rounded.
▼				3.40			End of pit at 3.40 m

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 3.4m

Trial Pit Log

Trialpit No
P1 TPX1
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661626.00 - 756186.00 Level:	Date 18/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.00	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			Peaty topsoil
				0.80			Soft brown gravelly SILT.
				1.50			Soft brownish grey gravelly, cobbly SILT with a small boulder (0.4m in length). Gravel and cobbles are sub-rounded.
	3.00	B		5.00			Grey sandy cobbly GRAVEL with boulders. Coarse grained sand with sub-rounded gravel and cobbles.
							End of pit at 5.00 m

1 2 3 4 5

Remarks: Pit dry

Stability: Instability of trial pit walls at 5m

Trial Pit Log

Trialpit No
P1 TPX2
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661755.00 - 755767.00 Level:	Date 18/08/2020
Location: Co. Meath		Dimensions (m): Depth 4.70	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Peaty topsoil
				0.30			Firm brown slightly gravelly SILT.
				0.90			Greyish brown sandy, silty GRAVEL with cobbles. Medium grained sand with well-rounded gravels and cobbles.
				3.60			Firm orange/ brown slightly gravelly CLAY.
▼				3.70			Grey sandy silty GRAVEL. Coarse grained sand with well rounded gravel.
				4.70			End of pit at 4.70 m

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 4.7

Trial Pit Log

Trialpit No
P1 TPX3
Sheet 1 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661859.00 - 755820.00 Level:	Date 18/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.70	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			Peaty Topsoil
				0.40			Firm brown slightly gravelly SILT. Gravel is sub-rounded.
							Brown/ grey silty sandy GRAVEL with cobbles. Medium grained sand with well-rounded gravel and cobbles.
	3.50	B					
							Continued on next sheet

1 2 3 4 5

Remarks: Trial pit moved to area allowing distance of 100m between pit and dwelling as requested by landowner. Pit dry.

Stability: Pit stable

Trial Pit Log

Trialpit No
P1 TPX3
Sheet 2 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661859.00 - 755820.00 Level:	Date 18/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.70	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				5.50			Firm brown CLAY.
				5.70			End of pit at 5.70 m

6
7
8
9
10

Remarks: Trial pit moved to area allowing distance of 100m between pit and dwelling as requested by landowner. Pit dry.

Stability: Pit stable

Trial Pit Log

Trialpit No
P1 TPX4
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661667.00 - 755996.00 Level:	Date 18/08/2020
Location: Co. Meath		Dimensions (m): Depth 3.50	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.70			Soft dark brown, fibrous PEAT.
▼				3.50			Soft to firm, grey, sandy, gravelly SILT with cobbles. Gravel is sub-rounded and cobbles are angular. Boulder at approx 1.2m bgl measuring 0.8m in length End of pit at 3.50 m

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 3.5m

Trial Pit Log

Trialpit No
P1 TPX5
Sheet 1 of 1

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661605.00 - 755872.00 Level:	Date 18/08/2020
Location: Co. Meath		Dimensions (m): Depth 2.50	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Firm dark brown, fibrous PEAT.
▼				0.90			Firm grey slightly gravelly SILT. Gravel is sub-rounded.
				2.50			End of pit at 2.50 m

1
2
3
4
5

Remarks:

Stability: Instability of trial pit walls at 2.5m

Trial Pit Log

Trialpit No
P1 TPX6
Sheet 1 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661663.00 - 755839.00 Level:	Date 18/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.40	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Soft to firm brown, gravelly SILT. Gravel is sub-rounded.
				1.00			Grey sandy silty GRAVEL with cobbles. Sand is medium grained and gravel and cobbles are sub-rounded.
	2.00	B					
				3.00			Soft brown slightly gravelly CLAY.
				3.40			Grey gravelly SAND with cobbles. Coarse grained sand with sub-rounded gravel and cobbles.
							Continued on next sheet

Remarks: Pit dry

Stability: Pit stable

Trial Pit Log

Trialpit No
P1 TPX6
Sheet 2 of 2

Project Name: Ballivor Wind Farm	Project No. P2318	Co-ords: 661663.00 - 755839.00 Level:	Date 18/08/2020
Location: Co. Meath		Dimensions (m): Depth 5.40	Scale 1:25
Client: Bord na Mona			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				5.40			End of pit at 5.40 m

Remarks: Pit dry

Stability: Pit stable

Summary of Classification Test Results

Project No.	Project Name
2020Lab104	Ballivor Wind Farm

Hole No.	Sample Ref	Top	Base	Type		Soil Description	Density bulk Mg/m3	Density dry Mg/m3	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Remarks
TP-B	1	3.50		B		Dark grey sandy very silty medium and coarse GRAVEL.			13.0	40	26	17	9		CL
TP-C	1	0.00		B		Dark grey very silty very sandy medium GRAVEL.			12.0	30					
TPX1	1	3.00		B		Dark grey silty sandy coarse GRAVEL.			9.5	16					
TPX3	1	3.50		B		Grey silty very sandy coarse GRAVEL.			5.2	9					
TPX6	1	2.00		B		Grey silty coarse SAND and fine GRAVEL.			8.0	18					

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: wd - water displacement; wi - immersion in water

Linear measurement unless : 4pt cone unless : Liquid Limit; 1pt - single point test; NP - Non Plastic

Particle density: sp - small pyknometer; gj - gas jar

Date Printed: 29/09/2020

QC From No: R1

Approved By

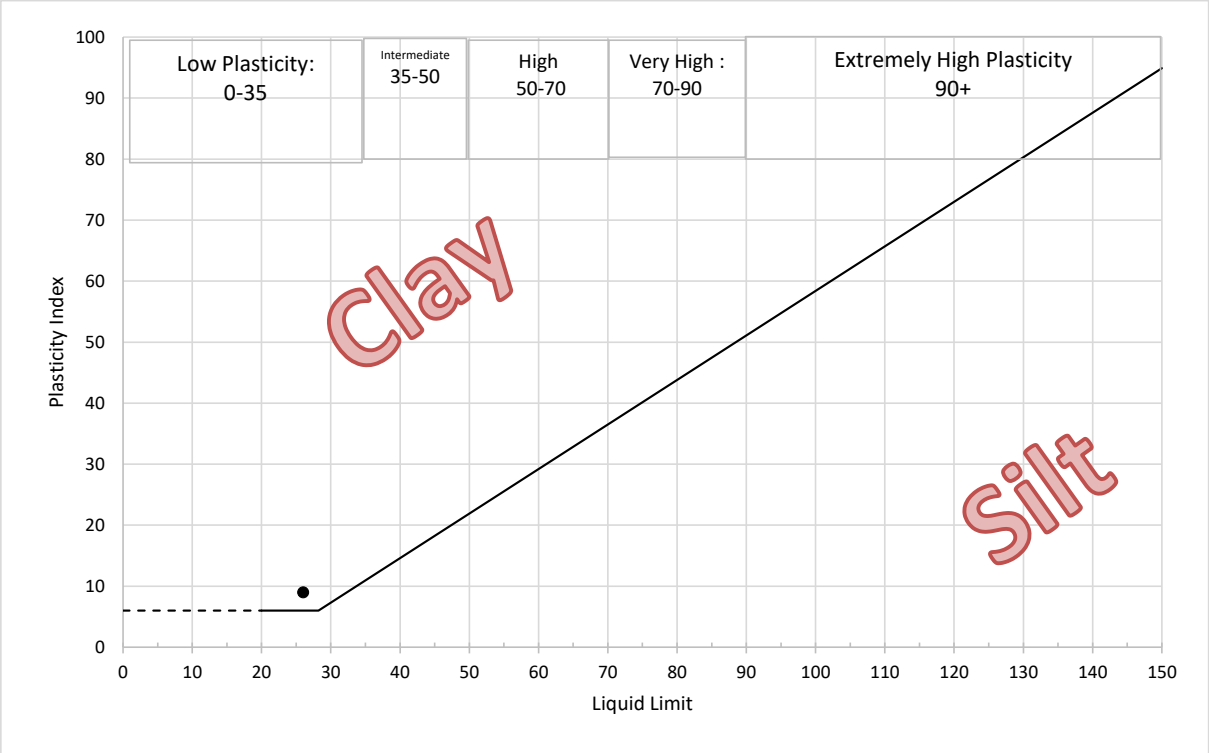
Table 1

sheet 1

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	Plasticity (A-Line) Chart	Project Number
Project Name:	**Ballivor Wind Farm**	
Location:		2020Lab104



Abreviations in the remarks column of the Classification Summary Sheet: C = Clay, M = Silt

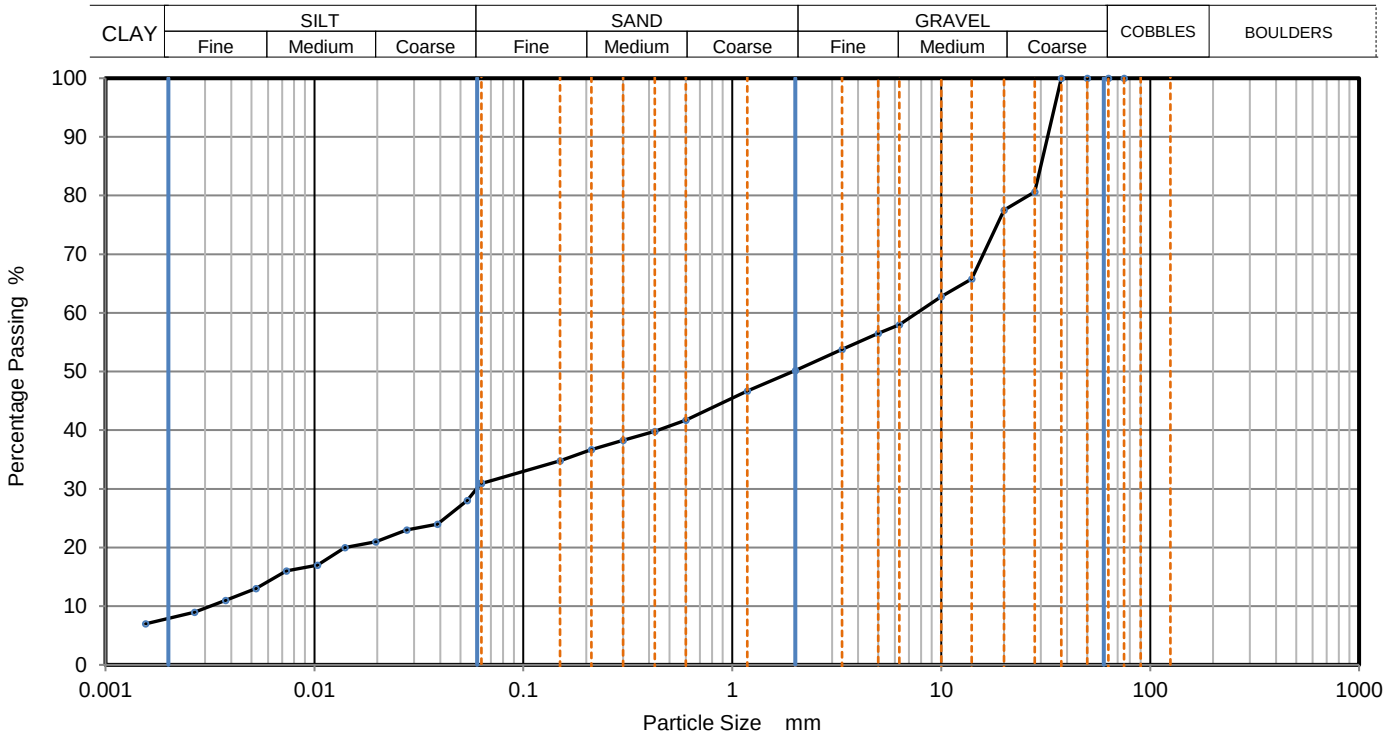
Plasticity abeviations: L = Low, I = Intermediate = H = High, V = Very High, E = Extremely High.

The letter O is added to the symbol of any material containing a significant proportion of organic material.

Chart taken from BS5930: 2010

QC Form: R1

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TP-B
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark grey sandy very silty medium and coarse GRAVEL.			Depth, m	3.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL1202009090



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	31
		0.0539	28
75	100	0.0388	24
63	100	0.0276	23
50	100	0.0196	21
37.5	100	0.0140	20
28	81	0.0103	17
20	78	0.0073	16
14	66	0.0053	13
10	63	0.0038	11
6.3	58	0.0027	9
5	57	0.0016	7
3.35	54		
2	50		
1.18	47		
0.6	42	Particle density (assumed)	
0.425	40	2.65	Mg/m3
0.3	38		
0.212	37		
0.15	35		
0.063	31		

Dry Mass of sample, g	640

Sample Proportions	% dry mass
Very coarse	0
Gravel	50
Sand	19
Silt	23
Clay	8

Grading Analysis		
D100	mm	
D60	mm	7.63
D30	mm	0.0597
D10	mm	0.0031
Uniformity Coefficient		2500
Curvature Coefficient		0.15

Remarks

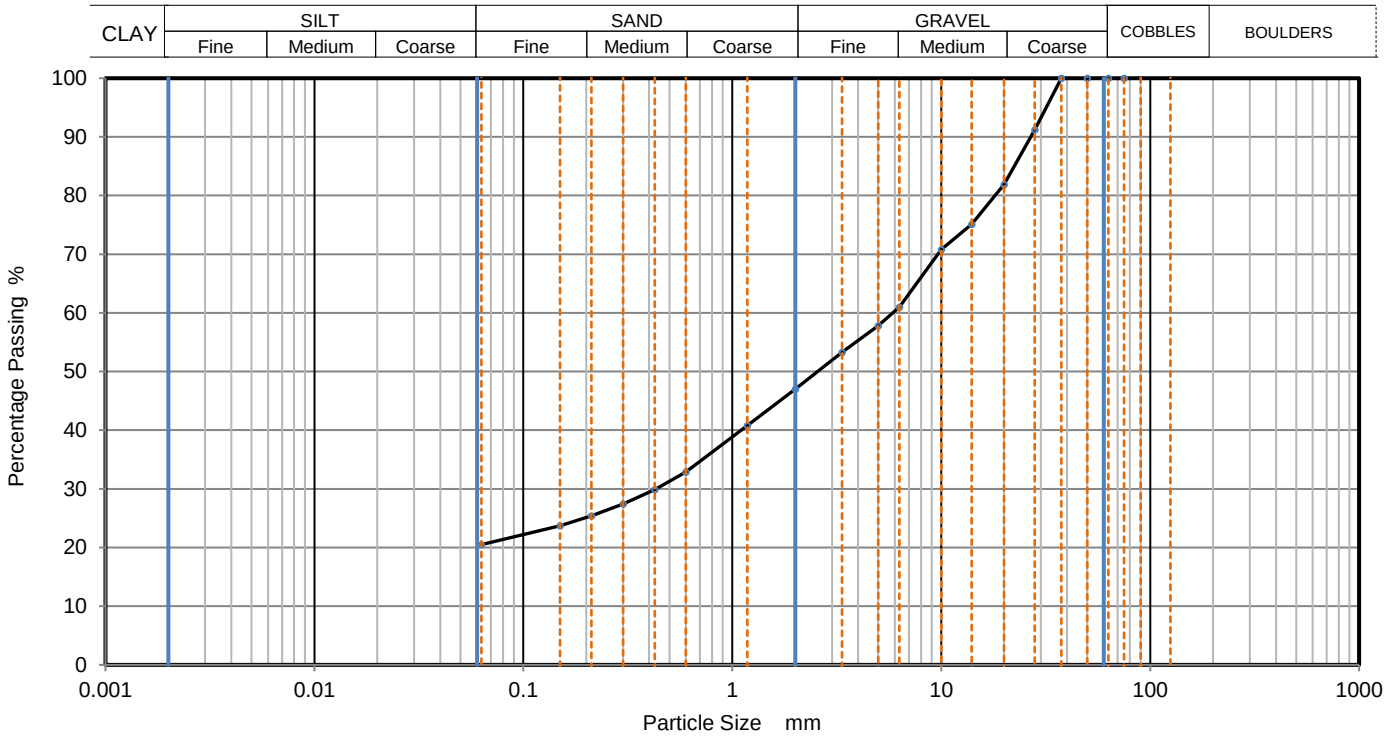
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	29/09/2020 09:14	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TP-C
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark grey very silty very sandy medium GRAVEL.			Depth, m	0.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202009091



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	91		
20	82		
14	75		
10	71		
6.3	61		
5	58		
3.35	53		
2	47		
1.18	41		
0.6	33		
0.425	30		
0.3	27		
0.212	25		
0.15	24		
0.063	21		

Dry Mass of sample, g	760

Sample Proportions	% dry mass
Very coarse	0
Gravel	53
Sand	27
Fines <0.063mm	21

Grading Analysis		
D100	mm	
D60	mm	5.87
D30	mm	0.43
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

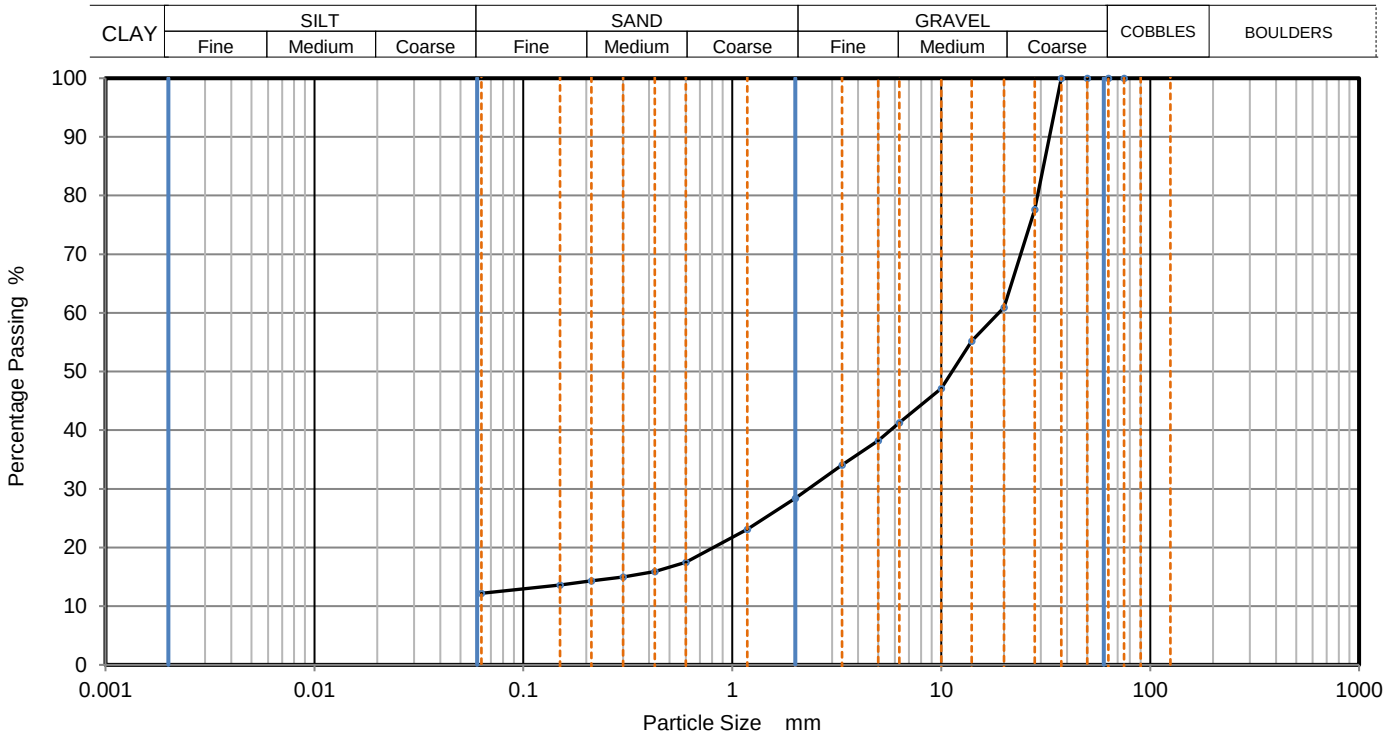
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	29/09/2020 09:14	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TPX1
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark grey silty sandy coarse GRAVEL.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202009093



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	78		
20	61		
14	55		
10	47		
6.3	41		
5	38		
3.35	34		
2	28		
1.18	23		
0.6	18		
0.425	16		
0.3	15		
0.212	14		
0.15	14		
0.063	12		

Dry Mass of sample, g	639

Sample Proportions	% dry mass
Very coarse	0
Gravel	72
Sand	16
Fines <0.063mm	12

Grading Analysis		
D100	mm	
D60	mm	18.9
D30	mm	2.31
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

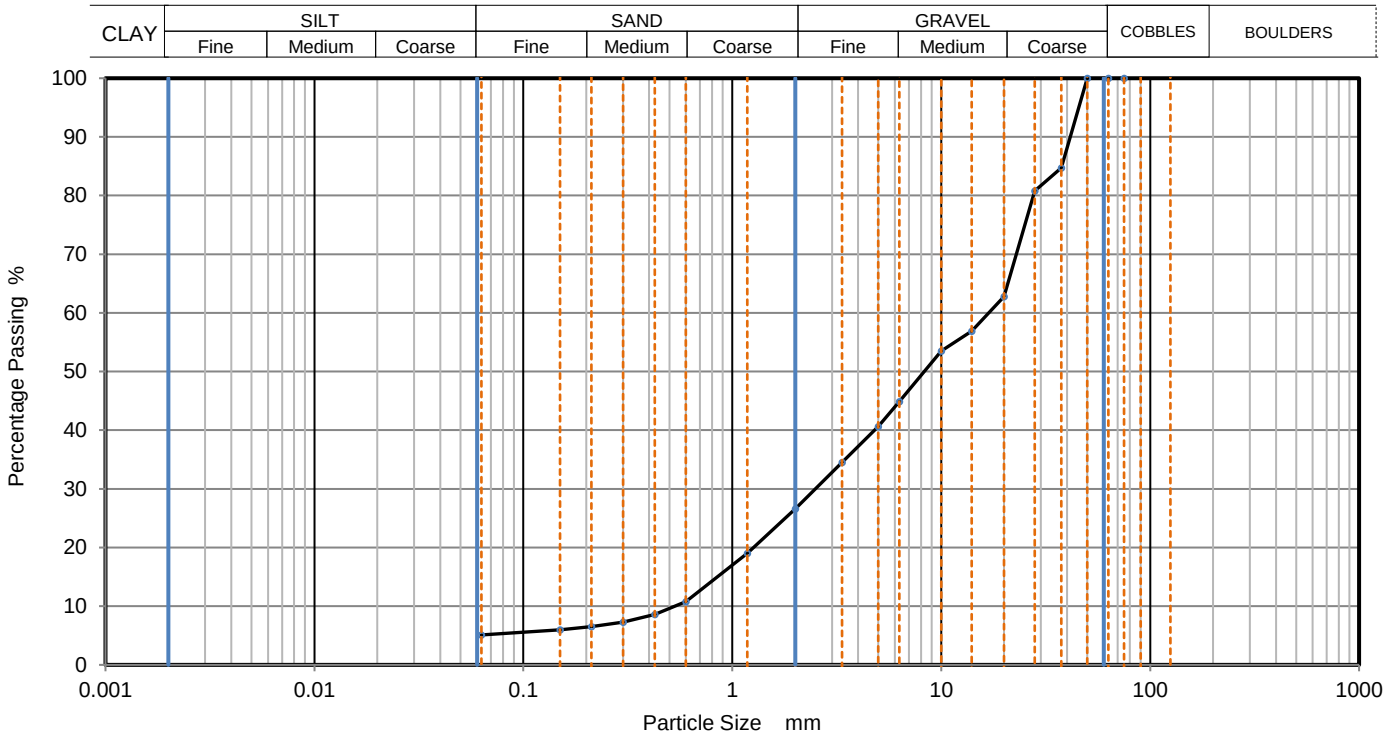
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	29/09/2020 09:14	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TPX3
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey silty very sandy coarse GRAVEL.			Depth, m	3.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202009094



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	85		
28	81		
20	63		
14	57		
10	54		
6.3	45		
5	41		
3.35	35		
2	27		
1.18	19		
0.6	11		
0.425	9		
0.3	7		
0.212	7		
0.15	6		
0.063	5		

Dry Mass of sample, g	893

Sample Proportions	% dry mass
Very coarse	0
Gravel	73
Sand	22
Fines <0.063mm	5

Grading Analysis		
D100	mm	
D60	mm	16.9
D30	mm	2.5
D10	mm	0.527
Uniformity Coefficient		32
Curvature Coefficient		0.7

Remarks

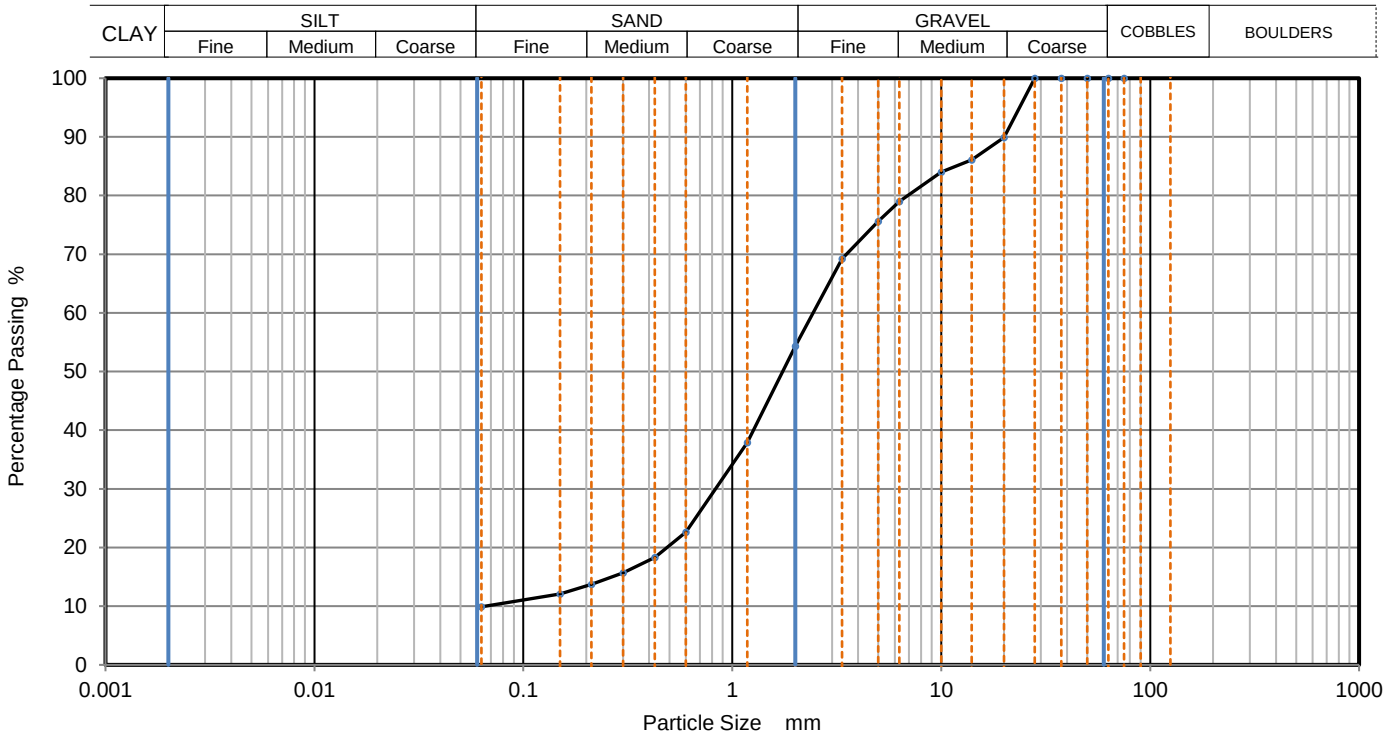
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	29/09/2020 09:14	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TPX6
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey silty coarse SAND and fine GRAVEL.			Depth, m	2.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202009095



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	90		
14	86		
10	84		
6.3	79		
5	76		
3.35	69		
2	54		
1.18	38		
0.6	23		
0.425	18		
0.3	16		
0.212	14		
0.15	12		
0.063	10		

Dry Mass of sample, g	722

Sample Proportions	% dry mass
Very coarse	0
Gravel	46
Sand	44
Fines <0.063mm	10

Grading Analysis		
D100	mm	
D60	mm	2.44
D30	mm	0.832
D10	mm	0.065
Uniformity Coefficient		38
Curvature Coefficient		4.4

Remarks

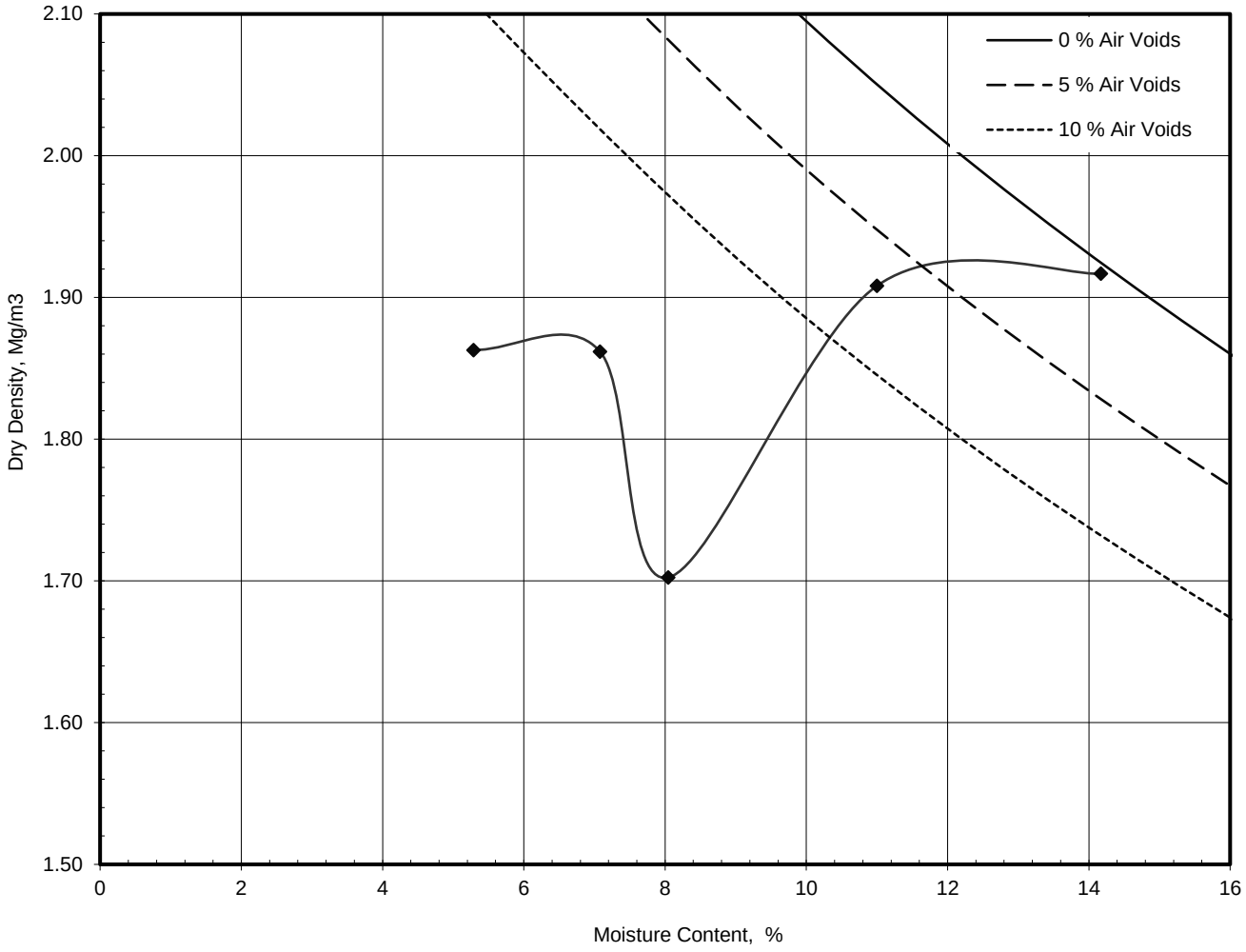
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	29/09/2020 09:14	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IDL	Dry Density / Moisture Content Relationship Vibrating Hammer Compaction			Job Ref	2020Lab104
				Borehole / Pit No	TPX1
Site Name	**Ballivor Wind Farm**			Sample No	1
Soil Description	Dark grey silty sandy coarse GRAVEL.			Depth	3.00 m
Specimen Ref.	1	Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.7 Vibrating Hammer Method			Keylab ID	IDL1202009093
				Compaction Test Reference/No.	



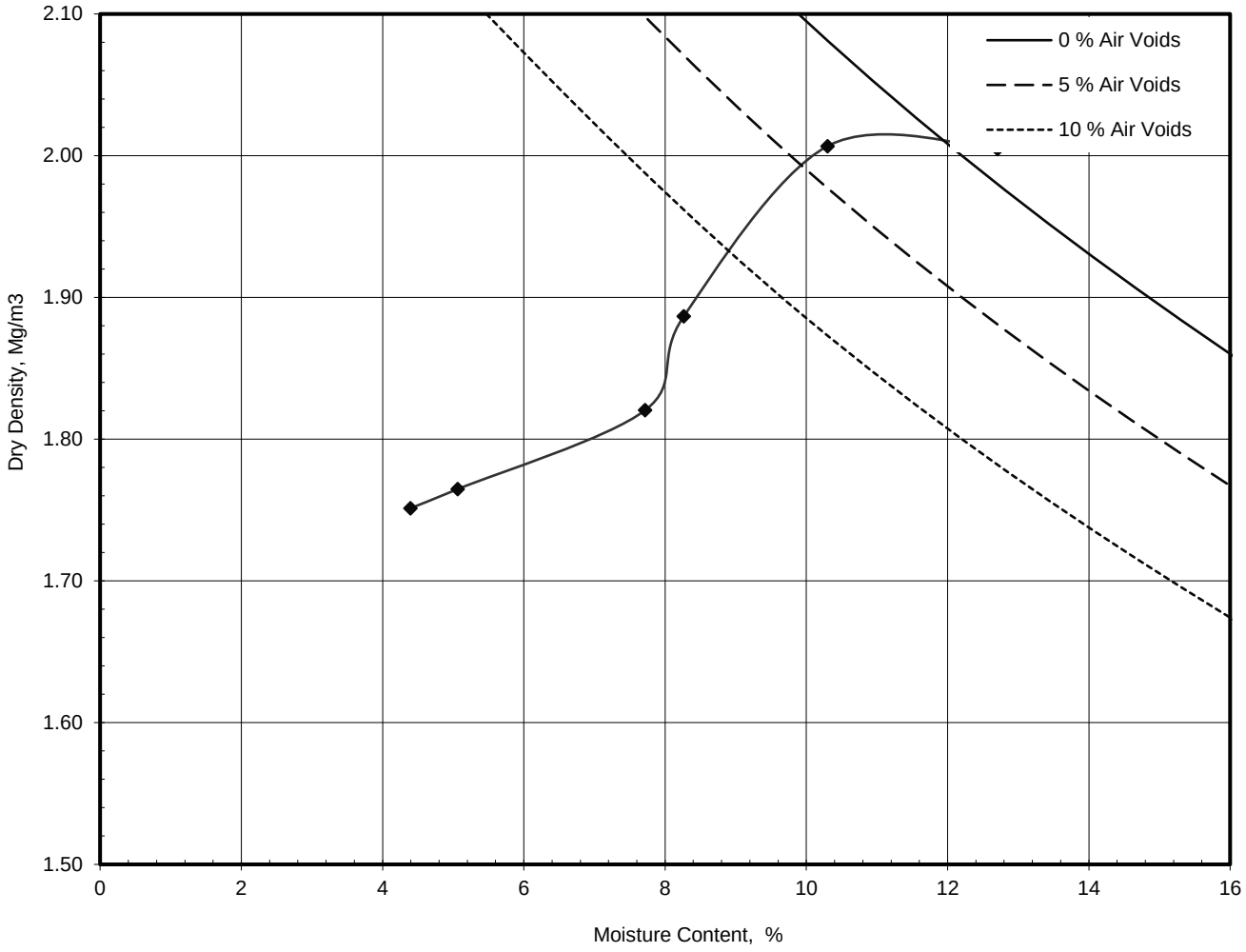
Preparation		-2146826273
Mould Type		CBR
Samples Used		
Material Retained on 37.5 mm Sieve	%	
Material Retained on 20.0 mm Sieve	%	
Particle Density - Assumed	Mg/m³	2.65

Maximum Dry Density	Mg/m³	**1.93**

Optimum Moisture Content	%	**12**

Operator	Checked	Approved	Remarks	**Fig**
	Administrator			Sheet 1 of 1

IDL	Dry Density / Moisture Content Relationship Vibrating Hammer Compaction			Job Ref	2020Lab104
				Borehole / Pit No	TPX6
Site Name	**Ballivor Wind Farm**			Sample No	1
Soil Description	Grey silty coarse SAND and fine GRAVEL.			Depth	2.00 m
Specimen Ref.	1	Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.7 Vibrating Hammer Method			Keylab ID	IDL1202009095
				Compaction Test Reference/No.	



Preparation		Material used was natural and air dried
Mould Type		CBR
Samples Used		Composite specimens tested
Material Retained on 37.5 mm Sieve	%	
Material Retained on 20.0 mm Sieve	%	
Particle Density - Assumed	Mg/m³	2.65

Maximum Dry Density	Mg/m³	**2.02**

Optimum Moisture Content	%	**11**

Operator	Checked	Approved	Remarks	**Fig**
	Administrator			Sheet 1 of 1

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

APPENDIX F

Infrastructure Ground Investigation, IDL, 2021

IRISH DRILLING LIMITED

LOUGHREA, CO. GALWAY, IRELAND

CONTRACT DRILLING
SITE INVESTIGATION

Phone: (091) 841 274
Fax: (091) 847 687

email: info@irishdrilling.ie

BALLIVOR WIND FARM

SITE INVESTIGATION CONTRACT FACTUAL REPORT

Bord na Mona,
Newbridge,
Co. Kildare.

Fehily Timoney & Company,
Consulting Engineers,
Singleton's Lane,
Bagenalstown,
Carlow.

	Prepared by	Approved by	Rev. Issue Date:	Revision No.
	Ronan Killeen	Declan Joyce	28th April 2021	20 _MH_103/01
Signature	RK	DJ		

FOREWORD

The borehole and trial pit records have been compiled from an examination of the samples by a Geotechnical Engineer and from the Drillers' descriptions.

The report presents an opinion on the configuration of the strata within the site based on the borehole and trial pit results. The assumptions, though reasonable, are given for guidance only and no liability can be accepted for changes in conditions not revealed by the boreholes and trial pits.

The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

Contents:

1.0 Introduction.

Irish Drilling Ltd. (IDL) was instructed by Fehily Timoney & Company, Consulting Engineers, on behalf of Bord na Mona, to carry out a site investigation at the site of the proposed Ballivor Wind Farm.

This site investigation was carried out to provide detailed factual geotechnical information of the underlying ground conditions at the proposed wastewater treatment works site.

The fieldwork commenced on February 1st 2021 and was completed on February 15th 2021.

2.0 Site & Geology

The site is located near Ballivor, County Meath.

The fieldwork was carried out predominantly on peat lands owned by Bord na Mona.

Site Plans, prepared by the client's representatives and amended by IDL to show approximate 'as-built' locations, are included with this report.

Geological Survey Maps of the area indicate that the site is underlain by the Lower Carboniferous Limestone Rock Formation.

3.0 Fieldwork.

The following plant was mobilised to site to carry out fieldwork operations:

Dando 2000 Cable Percussive Boring Rig.
Zaxis 120 Wide-Tracked Excavator.

Fieldwork carried out to date has included the following:

Sixteen cable percussion (Shell & Auger) boreholes were completed using a Dando 2000 Cable Percussive Boring Rig. The boreholes were bored to 'refusal' or to depths as instructed by the client's representatives. A 're-bore' was carried out at location BPA BH03 where a relatively shallow 'refusal' was encountered.

The borehole depths ranged from 1.70m to 7.70m below ground level.

In–Situ testing consisting of Standard Penetration Tests were carried out at regular intervals (predominantly 1.0m intervals) or as instructed by the client's representatives.

Disturbed bulk and jar soil samples were taken at each change in strata and at a maximum of 1.50m intervals. The samples were returned to the laboratory and logged by a Geotechnical Engineer and presented for testing.

A 50mm diameter standpipe was installed in the following cable percussive borehole locations to allow for monitoring of groundwater levels over a prolonged period of time: BH 02, BH 05, BH 08, BH 12, BPA BH01 and BPA BH 02.

A summary of water levels recorded during the fieldwork period is included with this report as Appendix 3.

Fifty-two trial pits were excavated on site using a tracked excavator.

The pits were logged and photographed by an Engineer with observations made on ground conditions, pit stability, water ingress and services encountered.

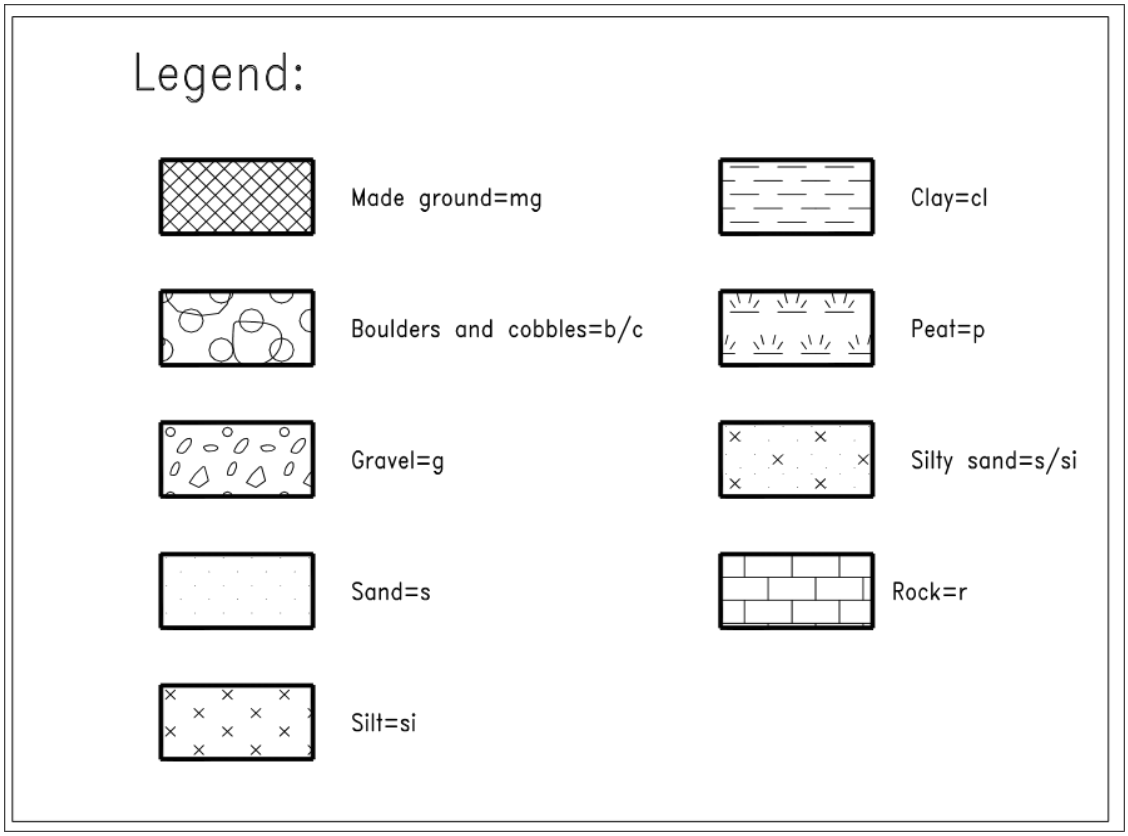
Small and bulk disturbed soil samples were recovered at each change in strata and returned to the laboratory and presented for testing. In-situ testing consisting of hand-held shear vanes were also frequently carried out in cohesive soils.

The borehole and trial pit locations were set out on site using a Trimble CU Bluetooth GPS Surveying Unit and the co-ordinates are included on the logs presented in the appendices.

All fieldwork co-ordinates are reported to Irish Transverse Mercator (ITM) with Reduced Levels recorded relative to Malin Head Datum and with an accuracy level of + or – 0.10m.

The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

The following Key Legend Table details the symbology used on the engineering logs to describe ground conditions encountered:



Ground conditions encountered during the completion of the fieldwork were typical and as expected for this region and predominantly consisted of Peat overlying Glacial Tills overlying possible bedrock.

The Glacial Tills in general consisted of slightly sandy gravelly silt/clay and/or silty sands and gravels with occasional, some or many cobbles and boulders.

Peat was encountered at all boreholes and trial pits at a depth ranging from 0.50m to 4.90m below ground level.

For detailed descriptions of the ground conditions encountered please refer to the engineering logs included in the appendices of this report.

4.0 Laboratory Testing

Representative samples recovered from the boreholes and trial pits were scheduled for testing in the laboratory.

The test schedules were prepared by the Client's Engineer and included some or all of the following tests on disturbed soil samples:

* Natural Moisture Content.
* Atterberg Limits.
* Particle Size Distribution.
* Sedimentation.
* Organic Content.
* Chemical (pH, Sulphate Total, Sulphate Water Gravimetric).
* Compaction (Compaction Light, MCV).

The soil and rock descriptions as noted on the borehole and trial pit logs are in general visual descriptions as observed and logged by our Engineers and are described in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations.

Soils descriptions (cohesive or otherwise) are also initially assessed based on the texture and 'feel' of the soil materials as witnessed by our Geotechnical Engineers and in accordance with IS EN 1997-2 and BS5930.

Where laboratory classification tests have been carried out on soil or rock samples then these visual descriptions have been amended accordingly to take into account the results of these classification tests.

The records of all fieldwork, laboratory test results and photographs are included in the appendices of this Factual Report.

Ronan Killeen

Ronan Killeen
Chartered Engineer
Irish Drilling Limited
April 28th 2021

Appendix 01
Borehole Records
(Cable Percussive)

Irish drilling LTD

BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-02**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	04-02-21 04-02-21	75.08	E 663,597.0 N 755,423.9

Engineer	GROUNDWATER STRIKES	Water strikes:	Rose to (@ 20 min.):	Sealed at:	Sheet / Rev.
FTCO/MKO		1st: 4.70m	4.00m	5.50m	Sheet 1 of 1 Rev. DRAFT
		2nd: 6.50m	4.30m		
		3rd:			

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft brown fibrous PEAT.		
1.00	SPT	N = 0 (0, 0, 0, 0, 0, 0)				(2.70)			
1.00	D2								
1.00-1.50	B4								
1.50	D5								
2.00	SPT	N = 14 (3, 2, 4, 4, 3, 3)					2.00m; firm.		
2.00-2.50	B7								
2.50	D8			72.38		2.70			
3.00	CPT	N = 23 (4, 5, 5, 7, 6, 5)					Stiff greyish green silty sandy CLAY with cobbles.		
3.00-3.50	B10					(1.30)			
3.50	D11		1	71.08		4.00			
4.00	SPT	N = 24 (3, 5, 4, 7, 6, 7)	2				Medium dense gravelly coarse SAND.		
4.00-4.50	B13					(0.70)			
4.50	D14		1	70.38		4.70			
5.00	CPT	N = 24 (3, 4, 4, 4, 7, 9)					Medium dense grey sandy silty coarse GRAVEL with cobbles. Cobbles are angular.		
5.00-5.50	B16					(1.50)			
5.50	D17			68.88		6.20			
6.50	CPT	N = 43 (5, 7, 8, 7, 10, 18)	2				Dense grey brown angular cobbles. Possible broken rock.		
6.50-7.00	B19					(1.10)			
7.00	D20			67.78		7.30			
7.10	CPT	50 for 70 mm (25, -, 50)					BH terminated at 7.30m bgl. Obstruction as broken rock.		
7.10-7.30	B22								
7.30	D23								

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To
04-02-21	17.00	7.30	7.00	203	3.60	7.1	7.3	1		

GENERAL REMARKS

50mm standpipe installed. Response zone 4.30m to 7.30m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

Irish drilling LTD

BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-04**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	01-02-21 01-02-21	75.62	E 663,640.6 N 755,442.9

Engineer	GROUNDWATER STRIKES	Sheet
FTCO/MKO	Water strikes: 1st: 7.40m 2nd: 3rd: Rose to (@ 20 min.): 6.50m Sealed at: 6.50m	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft brown fibrous PEAT with rootlets.		
1.00	SPT	N = 1 (1, 0, 0, 1, 0, 0)							
1.00	D2								
1.00-1.50	B4								
1.50	D5					(3.80)			
2.00-2.45	U1006	2 blows							
2.50	D7								
3.00	SPT	N = 15 (2, 3, 3, 3, 4, 5)					3.00m: firm.		
3.00-3.50	B9								
3.50	D10			71.82		3.80			
4.00	CPT	N = 29 (4, 5, 7, 6, 8, 8)				(1.00)	Medium dense grey silty sandy GRAVEL with cobbles. Cobbles are angular.		
4.00-4.50	B12								
4.50	D13			70.82		4.80			
5.00	CPT	N = 19 (3, 3, 4, 5, 4, 6)					Firm dark grey slightly sandy gravelly SILT with cobbles. Cobbles are angular. 5.00m: stiff.		
5.00-5.50	B15								
5.50	D16					(2.60)			
6.50	CPT	N = 33 (5, 7, 9, 8, 8, 8)	1						
6.50-7.00	B18								
7.00	D19			68.22		7.40			
7.40	CPT	50 for 75 mm (25, -, 50)		67.92		7.70	Obstruction as possible rock.		
							BH terminated at 7.70m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
01-02-21	16.00	7.70	7.50	203		7.4	7.7	1			BH backfilled.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

Irish drilling LTD

BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-05**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	02-02-21 02-02-21	77.06	E 663,691.7 N 755,333.8

Engineer	GROUNDWATER STRIKES	Sheet
FTCO/MKO	Water strikes: Rose to (@ 20 min.): Sealed at: 1st: dry 2nd: 3rd:	1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft brown fibrous PEAT.		
1.00	D2								
1.00-1.45	U1003	1 blows							
1.00-1.50	B4					(3.00)			
1.50	SPT	N = 1 (1, 0, 0, 0, 0, 1)							
1.50	D5								
1.50-2.00	B7								
2.00	D8								
2.50-2.95	U1009	2 blows							
				74.06		3.00			
3.00	D10						Firm greyish green slightly sandy gravelly SILT with cobbles. Cobbles are angular.		
3.50	CPT	N = 11 (2, 1, 2, 2, 3, 4)							
3.50-4.00	B12								
4.00	D13					(2.60)			
4.50	CPT	N = 18 (3, 3, 4, 3, 5, 6)					4.50m: becoming stiff.		
4.50-5.00	B15								
5.00	D16								
				71.46		5.60			
5.50	CPT	N = 22 (2, 5, 7, 6, 5, 4)					Stiff grey slightly sandy slightly gravelly CLAY with cobbles. Cobbles are angular.		
5.50-6.00	B18								
6.00	D19					(1.40)			
6.50	CPT	N = 67 (3, 5, 3, 8, 9, 47)					6.50m: hard.		
6.50-7.00	B21			70.06		7.00			
7.00	D22			69.86		7.20	Obstruction as possible rock.		
							BH terminated at 7.20m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
02-02-21	16.00	7.20	7.00	203	basal seepage	7	7.2	1			50mm standpipe installed. Response zone 4.20m to 7.20m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-06**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	03-02-21 03-02-21	76.45	E 663,707.4 N 755,300.3

Engineer	GROUNDWATER STRIKES	Sheet
FTCO/MKO	Water strikes: 1st: dry 2nd: 3rd: Rose to (@ 20 min.): Sealed at:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft brown fibrous PEAT.		
1.00	SPT	N = 0 (0, 0, 0, 0, 0, 0)							
1.00	D2					(3.00)			
1.00-1.50	B4								
1.50	D5								
2.00	SPT	N = 0 (1, 0, 0, 0, 0, 0)							
2.00-2.50	B7								
2.50	D8								
				73.45		3.00			
3.00	SPT	N = 11 (2, 1, 2, 3, 4, 2)					Firm greyish green silty sandy CLAY with cobbles.		
3.00-3.50	B10								
3.50	D11								
4.00	CPT	N = 15 (2, 3, 4, 4, 4, 3)							
4.00-4.50	B13								
4.50	D14					(3.50)			
5.00	CPT	N = 19 (5, 7, 6, 3, 4, 6)					5.00m: stiff.		
5.00-5.50	B16								
5.50	D17								
				69.95		6.50			
6.50	CPT	N = 21 (3, 3, 4, 5, 4, 8)				(0.50)	Stiff dark grey slightlt sandy gravelly CLAY with cobbles. Cobbles are angular.		
6.50-7.00	B19			69.45		7.00			
7.00	CPT	50 for 20 mm (25, -, 50)		69.35		7.10	Obstruction as possible rock.		
7.00	D20						BH terminated at 7.10m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
03-02-21	13.00	7.10	7.00	203	basal seepage	7	7.1	1			BH backfilled.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-07**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	03-02-21 03-02-21	75.16	E 663,682.2 N 755,286.8

Engineer	GROUNDWATER STRIKES	Sheet / Rev.
FTCO/MKO	Water strikes: 1st: 6.30m Rose to (@ 20 min.): 5.50m Sealed at: 5.50m 2nd: 3rd:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft brown fibrous PEAT.		
1.00	SPT	N = 0 (1, 0, 0, 0, 0, 0)				(2.40)			
1.00	D2								
1.00-1.50	B4								
1.50	D5								
2.00-2.45	U1006	6 blows NR							
				72.76		2.40			
2.00-2.50	B7						Soft grey slightly sandy gravelly silty CLAY with cobbles. Cobbles are angular.		
2.50	D8								
3.00	CPT	N = 25 (4, 5, 9, 6, 5, 5)					3.00m: stiff.		
3.00-3.50	B10								
3.50	D11					(2.40)			
4.00	CPT	N = 23 (3, 3, 5, 2, 7, 9)							
4.00-4.50	B13								
4.50	D14								
				70.36		4.80			
5.00	CPT	N = 20 (4, 4, 5, 4, 5, 6)					Firm dark grey slightly sandy slightly gravelly SILT with cobbles. Cobbles are angular. 5.00m: stiff.		
5.00-5.50	B16		1						
5.50	D17					(1.30)			
				69.06		6.10			
6.10	CPT	50 for 150 mm (25, -, 39, 11)	1	68.86		6.30	Obstruction as possible rock.		
							BH terminated at 6.30m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
03-02-21	17.00	6.30	6.00	203	3.70	6.1	6.3	1			BH backfilled.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-08**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	10-02-21 10-02-21	74.70	E 663,616.2 N 755,218.7

Engineer	GROUNDWATER STRIKES	Sheet
FTCO/MKO	Water strikes: 1st: dry 2nd: 3rd: Rose to (@ 20 min.): Sealed at:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft blackish brown fibrous PEAT.		
1.00	D2								
1.00-1.45	U1003	2 blows							
1.50	D4					(3.40)			
2.00	SPT	N = 0 (0, 0, 0, 0, 0, 0)							
2.00-2.50	B6								
2.50	D7								
3.00	SPT	N = 3 (1, 0, 0, 0, 1, 2)		71.30		3.40			
3.00-3.50	B9						Soft grey slightly gravelly slightly sandy clayey SILT with cobbles. Cobbles are angular.		
3.50	D10								
4.00	CPT	N = 17 (2, 3, 7, 4, 3, 3)				(1.60)	4.00m: firm.		
4.00-4.50	B12								
4.50	D13			69.70		5.00			
5.00	CPT	N = 28 (3, 5, 4, 7, 9, 8)					Stiff grey slightly sandy slightly gravelly CLAY with cobbles and boulders. Boulders are rounded.		
5.00-5.50	B15								
5.50	D16					(1.20)			
6.00	CPT	75 Seating Blows for 137 mm (25, 50)		68.50		6.20			
				68.30		6.40	Obstruction as possible rock.		
							BH terminated at 6.40m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m
10-02-21	13.00	6.40	6.00	203	

Chiselling

From	To	Hours
6.2	6.4	1

Water Added

From	To

GENERAL REMARKS

50mm standpipe installed. Response zone 3.40m to 6.40m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-09**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	04-02-21 04-02-21	74.99	E 663,669.4 N 755,246.7

Engineer	GROUNDWATER STRIKES	Sheet
FTCO/MKO	Water strikes: Rose to (@ 20 min.): Sealed at: 1st: dry 2nd: 3rd:	1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft brown fibrous PEAT.		
1.00	SPT	N = 0 (1, 0, 0, 0, 0, 0)				(2.40)			
1.00	D2								
1.00-1.50	B4								
1.50	D5								
2.00	SPT	N = 2 (1, 0, 1, 0, 0, 1)		72.59		2.40			
2.00-2.50	B7						Soft to firm greyish green silty sandy CLAY with cobbles.		
2.50	D8								
3.00	CPT	N = 17 (2, 2, 3, 7, 3, 4)				(1.60)	3.00m: stiff.		
3.00-3.50	B10								
3.50	D11			70.99		4.00			
4.00	CPT	N = 14 (4, 5, 3, 4, 3, 4)					Firm dark grey slightly sandy slightly gravelly silty CLAY with cobbles. Cobbles are angular.		
4.00-4.50	B13					(1.00)			
4.50	D14			69.99		5.00			
5.00	CPT	50 for 85 mm (25, -, 41, 9)		69.79		5.20	Obstruction as possible rock.		
							BH terminated at 5.20m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
04-02-21	12.00	5.20	5.00	203	basal seepage	5	5.2	1			BH backfilled.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-10**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	05-02-21 05-02-21	74.87	E 663,716.8 N 755,152.3

Engineer	GROUNDWATER STRIKES	Sheet / Rev.
FTCO/MKO	Water strikes: 1st: 5.10m 2nd: 3rd: Rose to (@ 20 min.): 4.50m Sealed at:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft brown fibrous PEAT.		
1.00	D2								
1.00-1.45	U1003	1 blows							
1.50	D4					(3.40)			
2.00	SPT	N = 0 (0, 0, 0, 0, 0, 0)							
2.00-2.50	B7								
2.50	D8								
3.00	CPT	N = 11 (1, 2, 1, 2, 3, 5)		71.47		3.40	3.00m; firm.		
3.00-3.50	B10						Soft grey slightly sandy silty gravelly CLAY.		
3.50	D11					(1.10)			
4.00	CPT	N = 8 (1, 1, 1, 2, 3, 2)	1	70.37		4.50			
4.00-4.50	B13						Loose grey very sandy very silty medium GRAVEL with cobbles. Cobbles are angular.		
4.50	D14					(0.60)			
5.00	CPT	50 for 125 mm (25, -, 30, 20)		69.77		5.10			
				69.47		5.40	Obstruction as possible rock.		
							BH terminated at 5.40m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
05-02-21	12.00	5.40	5.00	203	4.00	5.1	5.4	1			BH backfilled.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-11**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	08-02-21 08-02-21	75.66	E 663,735.6 N 755,120.5

Engineer	GROUNDWATER STRIKES	Sheet / Rev.
FTCO/MKO	Water strikes: 1st: 5.50m 2nd: 3rd: Rose to (@ 20 min.): 4.00m Sealed at:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Firm brown fibrous PEAT.		
1.00	SPT	N = 0 (1, 0, 0, 0, 0, 0)				(2.20)			
1.00	D2								
1.00-1.50	B4								
1.50	D5								
2.00	SPT	N = 0 (0, 0, 0, 0, 0, 0)		73.46		2.20			
2.00-2.50	B7						Soft greyish green slightly gravelly sandy silty CLAY.		
2.50	D8								
3.00	CPT	N = 13 (2, 2, 3, 4, 3, 3)				(2.20)	3.00m: firm.		
3.00-3.50	B10								
3.50	D11								
4.00	CPT	N = 16 (2, 1, 2, 3, 5, 6)	1				4.00m: stiff.		
4.00-4.50	B13			71.26		4.40			
4.50	D14						Firm grey slightly gravelly sandy CLAY with cobbles. Cobbles are angular.		
5.00	CPT	N = 66 (4, 5, 8, 7, 8, 43)				(1.10)	5.00m: hard.		
5.00-5.50	B16		1	70.16		5.50			
5.50	D17			70.06		5.60	Obstruction as possible rock.		
							BH terminated at 5.60m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
08-02-21	17.00	5.60	5.50	203	3.20	5.5	5.6	1			BH backfilled.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-12**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	09-02-21 09-02-21	74.86	E 663,667.2 N 755,127.8

Engineer	GROUNDWATER STRIKES	Sheet / Rev.
FTCO/MKO	Water strikes: 1st: 4.50m; Rose to (@ 20 min.): 4.00m; Sealed at: 2nd: 3rd:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft brown fibrous PEAT.		
1.00	SPT	N = 0 (1, 0, 0, 0, 0, 0)				(2.40)			
1.00	D2								
1.00-1.50	B4								
1.50	D5								
2.00	SPT	N = 12 (1, 1, 2, 2, 4, 4)		72.46		2.40	2.00m; firm.		
2.00-2.50	B7						Soft to firm grey slightly sandy slightly gravelly SILT with cobbles.		
2.50	D8								
3.00	CPT	N = 27 (2, 4, 7, 6, 5, 9)				(1.90)	3.00m; stiff.		
3.00-3.50	B10								
3.50	D11		1						
4.00	CPT	N = 68 (4, 3, 5, 9, 16, 38)		70.56		4.30			
4.00-4.50	B13			70.36		4.50	Very dense grey angular COBBLES.		
4.50	D14			70.26		4.60	Obstruction as possible rock.		
							BH terminated at 4.60m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m
09-02-21	12.00	4.60	4.50	203	3.90

Chiselling

From	To	Hours
4.5	4.6	1

Water Added

From	To

GENERAL REMARKS

50mm standpipe installed. Response zone 3.00m to 4.60m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-13**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	09-02-21 09-02-21	74.82	E 663,609.4 N 755,164.8

Engineer	GROUNDWATER STRIKES	Sheet / Rev.
FTCO/MKO	Water strikes: Rose to (@ 20 min.): Sealed at: 1st: dry 2nd: 3rd:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Firm brown fibrous PEAT with rootlets.		
1.00	SPT	N = 0 (0, 0, 0, 0, 0, 0)				(2.20)			
1.00	D2								
1.00-1.50	B4								
1.50	D5								
2.00		N = 26 (4, 6, 4, 7, 7, 8)		72.62		2.20			
2.00-2.45	U1006	5 blows					Firm grey slightly sandy gravelly silty CLAY with cobbles and boulders. Cobbles are angular.		
2.50	D7								
3.00	CPT	N = 67 (3, 5, 7, 7, 6, 47)				(1.70)	3.00m: stiff.		
3.00-3.50	B9								
3.50	D10			70.92		3.90			
4.00-4.50	B12						Dense grey gravelly coarse SAND.		
				70.42		(0.50) 4.40			
				70.22		4.60	Obstruction as possible rock.		
4.50	D13						BH terminated at 4.60m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
09-02-21	16.00	4.60	4.50	203	4.00	4.4	4.6	1			BH backfilled.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BH-14**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	08-02-21 08-02-21	75.11	E 663,562.8 N 755,153.0

Engineer	GROUNDWATER STRIKES	Sheet / Rev.
FTCO/MKO	Water strikes: 1st: 3.50m Rose to (@ 20 min.): 2.90m Sealed at: 2nd: 3rd:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft brown fibrous PEAT with rootlets.		
1.00	SPT	N = 0 (0, 0, 0, 0, 0, 0)							
1.00	D2					(2.90)			
1.00-1.50	B4								
1.50	D5								
2.00	SPT	N = 1 (1, 0, 0, 0, 0, 1)							
2.00-2.50	B7								
2.50	D8		1	72.21		2.90			
3.00	CPT	N = 15 (3, 4, 2, 5, 4, 4)				(0.60)	Firm dark grey grey slightly sandy slightly gravelly SILT.		
3.00-3.50	B10		1	71.61		3.50			
3.50	D11						Medium dense dark grey slightly silty very sandy medium and fine GRAVEL with clay bands.		
4.00	CPT	N = 23 (4, 5, 5, 6, 4, 8)				(1.70)			
4.00-4.50	B13								
4.50	D14								
5.00	CPT	50 for 10 mm (18, 7, 50)		69.91		5.20			
				69.81		5.30	Obstruction as possible rock.		
							BH terminated at 5.30m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
08-02-21	12.00	5.30	5.20	203	3.00	5.2	5.3	1			BH backfilled.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BPA-BH01**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	16-02-21 16-02-21	78.02	E 664,271.0 N 755,319.0

Engineer	GROUNDWATER STRIKES	Sheet
FTCO/MKO	Water strikes: Rose to (@ 20 min.): Sealed at: 1st: dry 2nd: 3rd:	1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1						Very soft blackish brown PEAT.		
1.00	SPT	N = 0 (1, 0, 0, 0, 0, 0)				(2.60)			
1.00	D2								
1.00-1.50	B4								
1.50	D5								
2.00	SPT	N = 10 (1, 2, 2, 3, 3, 2)					2.00m: firm.		
2.00-2.50	B7			75.42		2.60			
2.50	D8						Medium dense greyish brown sandy very silty medium GRAVEL with cobbles.		
3.00	CPT	N = 21 (4, 5, 6, 5, 5, 5)				(1.40)			
3.00-3.50	B10								
3.50	D11			74.02		4.00			
4.00	CPT	N = 34 (3, 5, 8, 10, 9, 7)					Dense greenish grey very silty very medium GRAVEL and COBBLES.		
4.00-4.50	B13					(1.00)			
4.50	D14			73.02		5.00			
5.00	CPT	50 for 35 mm (25, -, 50)		72.92		5.10	Obstruction as possible rock. BH terminated at 5.10m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
16-02-21	13.00	5.10	5.00	203		5	5.1	1			50mm standpipe installed. Response zone 3.10m to 5.10m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BPA-BH02**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	15-02-21 15-02-21	78.72	E 664,211.8 N 755,018.0

Engineer	GROUNDWATER STRIKES	Sheet
FTCO/MKO	Water strikes: Rose to (@ 20 min.): Sealed at: 1st: dry 2nd: 3rd:	1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1			78.32		0.40	PEAT.		
1.00	CPT	N = 39 (2, 3, 5, 8, 10, 16)					Firm dark grey slightly sandy gravelly SILT with cobbles.		
1.00	D2						1.00m: very stiff.		
1.00-1.50	B4								
1.50	D5					(3.10)			
2.00	CPT	N = 28 (3, 5, 5, 6, 8, 9)					2.00m: stiff.		
2.00-2.50	B7								
2.50	D8								
3.00	CPT	N = 22 (5, 7, 6, 5, 5, 6)							
3.00-3.50	B10			75.22		3.50			
3.50	D11						Medium dense silty very gravelly coarse SAND.		
4.00	CPT	N = 15 (2, 8, 3, 3, 4, 5)							
4.00-4.50	B13								
4.50	D14					(2.50)			
5.00	CPT	N = 29 (4, 4, 5, 6, 9, 9)							
5.00-5.50	B16								
5.50	D17								
6.00	CPT	50 for 0 mm (25, -, 50)		72.72		6.00	BH terminated at 6.00m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
15-02-21	13.00	6.00	6.00	203	basal seepage	6	6.0	1			BH backfilled.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BPA-BH03**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	15-02-21 15-02-21	76.34	E 664,184.5 N 754,811.6

Engineer	GROUNDWATER STRIKES	Sheet / Rev.
FTCO/MKO	Water strikes: Rose to (@ 20 min.): Sealed at: 1st: dry 2nd: 3rd:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1			75.84		(0.50) 0.50	Very soft brown PEAT.		
1.00	CPT	N = 57 (8, 10, 9, 8, 17, 23)				(1.10)	Medium dense grey slightly slightly sandy very silty GRAVEL with cobbles and boulders. 1.00m: very dense.		
1.00	D2			74.74		1.60			
1.00-1.50	B4			74.64		1.70	Obstruction.		
1.50	D5						BH terminated at 1.70m bgl. Obstruction.		

Boring Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m
15-02-21	14.30	1.70	1.50	203	

Chiselling

From	To	Hours
1.6	1.7	1

Water Added

From	To

GENERAL REMARKS

BH backfilled. Moved and set up at BHA-BH03A.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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BOREHOLE LOG

Project	Location	BOREHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**BPA-BH03A**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	15-02-21 15-02-21	76.36	E 664,187.3 N 754,812.3

Engineer	GROUNDWATER STRIKES	Sheet / Rev.
FTCO/MKO	Water strikes: 1st: 3.50m 2nd: 3rd: Rose to (@ 20 min.): Sealed at:	Sheet 1 of 1 Rev. DRAFT

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B1					(0.60)	Very soft brown PEAT.		
				75.76		0.60			
							Firm greyish brown slightly sandy slightly gravelly SILT with cobbles and boulders.		
1.00	CPT	N = 44 (4, 5, 9, 10, 8, 17)					1.00m: very stiff.		
1.00	D2					(1.90)			
1.00-1.50	B4								
1.50	D5								
2.00	CPT	N = 25 (3, 2, 8, 6, 5, 6)					2.00m: stiff.		
2.00-2.50	B7			73.86		2.50			
2.50	D8						Medium dense dark grey very sandy very silty medium GRAVEL.		
3.00	CPT	N = 24 (4, 5, 6, 5, 5, 8)							
3.00-3.50	B10		▼			(1.90)			
3.50	D11						3.50m: wet sandy.		
4.00	CPT	57 for 265 mm (8, 10, 10, 15, 20, 12)					4.00m: very dense.		
				71.96		4.40			
4.00-4.50	B13			71.86		4.50	Obstruction as possible rock - recovered as grey silty sandy fine to coarse GRAVEL.		
4.50	D14						BH terminated at 4.50m bgl. Obstruction as possible rock.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m	From	To	Hours	From	To	
15-02-21	17.00	4.50	4.50	203		4.45	4.5	1			50mm standpipe installed. Response zone 3.00m to 4.50m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Dando 2000	Bit Design	Driller: BT	Logged By: BT

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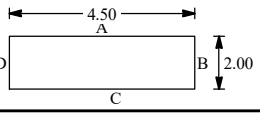
Appendix 02
Trial Pit Records

PROJECT: Ballivor Wind Farm		**TRIALPIT: BPA-TP01**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 664,221.7 N 755,132.4**	**Rev: DRAFT**
Ground level: 74.10m O.D.		**DATE: 12.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 2.40m
2nd: 3.30m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							73.20	0.90	Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W2 TV0 TH0.
1									Spongy brown fibrous PEAT. H4 B2 F2 R3 W3 TV0 TH0.
		1					71.70	2.40	
2							71.55	2.55	Stiff whitish grey slightly gravelly sandy SILT with rootlets. Gravel is angular fine to coarse.
									Grey silty sandy angular to subangular fine to coarse GRAVEL with high cobble content. Cobbles are angular to subangular.
3		2	B 1	3.20-3.40			70.80	3.30	
									Grey silty fine SAND.
4			B 2	4.00-4.20			69.90	4.20	
							69.60	4.50	Grey sandy SILT.
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water at 2.40m bgl. Rapid ingress of water at 3.30m bgl. TP backfilled with arisings.

Scale: 1:50

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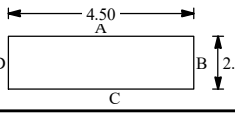
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: BPA-TP02**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** E 664,221.8 N 754,907.8
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 74.95m O.D.	**Rev: DRAFT**
	DATE: 12.2.21

GROUNDWATER

Water strikes: Rose to after:
1st: 2.40m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.40m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							74.85	0.10	Firm black fibrous PEAT.
									Firm orangish brown fibrous PEAT. H3 B2 F3 R2 W2 TV0 TH0.
1			VANE	1.00	33mm vane used 16 kN/m²		73.55	1.40	
			B 1 D 2	1.50-1.70 1.50-1.70			73.15	1.80	Stiff light grey slightly gravelly sandy SILT with rootlets. Gravel is angular to subrounded fine to coarse.
2		▼					72.55	2.40	Firm bluish grey sandy gravelly SILT with decaying organic material. Gravel is angular to rounded fine to coarse.
			B 3	2.50-2.70			71.95	3.00	Wet light grey silty gravelly medium and coarse SAND with medium cobble content. Cobbles are angular.
3							71.65	3.30	Bluish grey sandy gravelly SILT with high cobble content and high boulder content. Boulders are subangular to subrounded. Boulders are up to 600mm in length.
									Grey gravelly coarse SAND with high cobble content. Gravel is angular to subrounded fine to coarse. Cobbles are subrounded.
4							70.75	4.20	
						END			TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse and ingress of water.
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 2.40m bgl. TP backfilled with arisings.

Scale: 1:50

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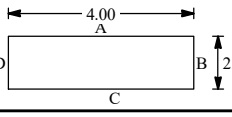
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-01**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**
ENGINEER: FTCO/MKO	**E 663,586.8 N 755,376.4**
Rig: Zaxis 120	
Rev: DRAFT	
Ground level: 75.17m O.D.	**DATE: 3.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 0.00m
2nd: 3.10m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.10m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							74.47	0.70	Heather over plastic dark brown amorphous PEAT.
			VANE	0.70	33mm vane used 15 kN/m²				
1									Firm orangish brown fibrous PEAT. H2 F3 R2 W2 TV0 TH0. Pungent odour.
							73.27	1.90	
2							73.17	2.00	Firm brown organic SILT with decaying organic material.
			B 1 D 2	2.10-2.30 2.10-2.30					Firm bluish grey sandy gravelly SILT with low cobble content. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular.
3							72.07	3.10	
			B 3	3.30-3.50					Dark grey fine SAND.
4							70.87	4.30	
						END			TP terminated at 4.30m bgl. Unable to progress TP - sidewall collapse and ingress of water.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water from g/l to 1.90m bgl. Rapid ingress of water at 3.10m bgl. TP backfilled with arisings.

Scale: 1:50

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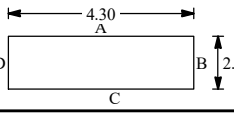
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-02**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 663,629.8 N 755,383.6**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 75.03m O.D.	**Rev: DRAFT**
	DATE: 2.2.21

GROUNDWATER

Water strikes: **Rose to after:**
1st: 0.00m
2nd: 3.30m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.30m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse after 20 minutes.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							74.33	0.70	Heather over spongy orangish and black brown pseudo fibrous PEAT.
1							73.58	1.45	Firm light brown fibrous PEAT. H3 B2 F2 R2 W1 TV0 TH0.
			B 1 D 2	1.60-1.80 1.60-1.80			73.43	1.60	Stiff white slightly gravelly SILT with low cobble content. Gravel is angular to subangular fine to coarse. Stiff locally firm bluish grey sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subrounded.
2									
3			B 3 D 4	2.80-3.00 2.80-3.00					
							70.53	4.50	
4									**END** TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water from g/l to 1.45m bgl. Rapid ingress of water at 3.30m bgl. TP backfilled with arisings.

Scale: 1:50

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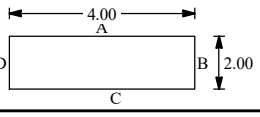
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-03**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 663,653.0 N 755,386.8**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 75.26m O.D.	**Rev: DRAFT**
	DATE: 1.2.21

GROUNDWATER
Water strikes: Rose to after:
1st: 1.90m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0			B 1	0.50-0.70			74.36	0.90	Heather over spongy brownish black pseudo fibrous PEAT.
1							73.36	1.90	Firm yellowish brown fibrous PEAT. H2 B2 F3 R2 W1 TV0 TH0. Pungent odour.
2			D 2 B 3	2.00-2.20 2.00-2.20			73.26	2.00	Soft light brown SILT.
							72.26	3.00	Soft bluish grey slightly gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular to subangular. 2.50m: firm.
3			D 4	3.20-3.40			70.76	4.50	Firm bluish grey slightly gravelly SILT with medium cobble content and medium boulder content. Gravel is angular to subangular fine to coarse. Cobbles are angular to subangular. Boulders are up to 1500mm in length. 4.00m: stiff.
4						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water at 1.90m bgl. TP backfilled with arisings.

Scale: 1:50

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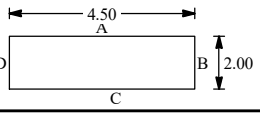
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-04**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 663,683.0 N 755,423.9**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 74.65m O.D.	**Rev: DRAFT**
	DATE: 4.2.21

GROUNDWATER

Water strikes: **Rose to after:**
1st: 1.90m **20min** 1.80m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
									Firm orangish brown fibrous PEAT. H3 B2 F3 R2 W0 TV0 TH0.
1			VANE B 1	1.00 1.00-1.20	33mm vane used 15 kN/m²		73.15	1.50	
		1	B 2 D 3	1.70-1.90 1.70-1.90			72.75	1.90	Soft light brown slightly sandy gravelly SILT with low cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular.
2			B 4	2.20-2.40			71.95	2.70	Grey sandy subrounded to rounded fine to coarse GRAVEL with high cobble content.
3							71.15	3.50	Stiff dark grey sandy gravelly SILT with high cobble content. Gravel is angular to rounded fine to coarse. Cobbles are angular.
4							70.15	4.50	Grey slightly silty gravelly COBBLES and BOULDERS. Boulders are up to 800mm in length.
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 1.90m bgl. TP backfilled with arisings.

Scale: 1:50

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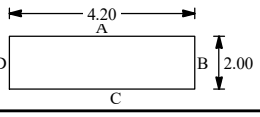
PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-05**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,752.3 N 755,451.5**	**Rev: DRAFT**
Ground level: 75.89m O.D.		**DATE: 4.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.20m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							75.74	0.15	Heather over plastic black amorphous PEAT. H8.
									Firm orangish brown fibrous PEAT. H2 B2 F3 R1 W1 TV0 TH0.
1			VANE	0.90	33mm vane used 12 kN/m²				
			B 1	1.80-2.00					
2									2.40m 3.90m: brown.
3							71.99	3.90	
4							71.89	4.00	Soft brown organic SILT with low cobble content. Cobbles are angular.
									Firm grey slightly gravelly sandy SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular.
							71.39	4.50	
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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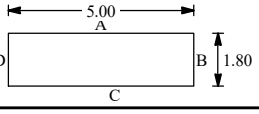
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-07**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,698.9 N 755,375.6** **Rev: DRAFT**
Ground level: 76.58m O.D.	**DATE: 1.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.80 * 5.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							76.23	0.35	Plastic black amorphous PEAT.
			VANE	0.70	33mm vane used 21 kN/m²				Firm yellowish brown fibrous PEAT. H3 B3 F3 R2 W2 TV0 TH0.
1			B 1	1.00-1.20					
2									
3							73.18	3.40	
							72.98	3.60	Soft brownish grey SILT.
			B 2 D 3	3.60-3.80 3.60-3.80					Firm damp grey slightly gravelly SILT with high cobble content. Gravel is angular to rounded fine to coarse. Cobbles are subrounded.
4							72.08	4.50	
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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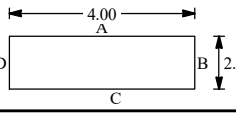
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-08**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 663,659.1 N 755,345.5**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 75.44m O.D.	**Rev: DRAFT**
	DATE: 2.2.21

GROUNDWATER

Water strikes: Rose to after:
1st: 1.20m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.30m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							74.74	0.70	Heather over brownish black amorphous PEAT.
							74.34	1.10	Firm orangish brown fibrous PEAT. H2 B2 F2 R2 W1 TV0 TH0.
1		▼	B 1	1.20-1.40			74.24	1.20	Firm white slightly gravelly organic SILT. Gravel is angular to subangular fine to coarse.
									Firm grey slightly slightly gravelly sandy SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular to subrounded.
2			B 2 D 3	2.20-2.40 2.20-2.40					2.00m: soft wet.
3									3.00m: firm.
			B 4 D 5	3.60-3.80 3.60-3.80					3.40m: with boulders.
4							71.14	4.30	
							70.94	4.50	Stiff dark bluish grey gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse.
									END TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water at 1.20m bgl. TP backfilled with arisings.

Scale: 1:50

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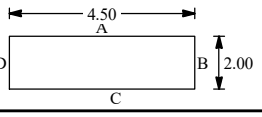
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-10**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 663,797.5 N 755,350.1**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 74.04m O.D.	**Rev: DRAFT**
	DATE: 4.2.21

GROUNDWATER

Water strikes: **Rose to after:**
1st: 0.40m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							73.94	0.10	Plastic black amorphous PEAT.
		1							Firm orangish brown fibrous PEAT. H3 F2 R2 W2 TV0 TH0.
1									1.00m: brown.
2							71.74	2.30	
							71.59	2.45	Soft light grey organic SILT.
			B 1	2.50-2.70					Grey slightly silty SAND and angular to subrounded fine to coarse GRAVEL with medium cobble content. Cobbles are angular.
3							70.84	3.20	
							70.64	3.40	Grey coarse SAND.
			B 2 D 3	3.50-3.70 3.50-3.70					Firm grey sandy SILT with rootlets.
4							69.84	4.20	
							69.54	4.50	Grey slightly silty gravelly medium to coarse SAND with cobbles. Gravel is angular to subrounded fine to coarse.
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 3.20m bgl. TP backfilled with arisings.

Scale: 1:50

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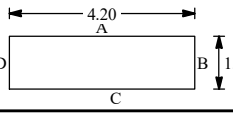
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-11**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,730.4 N 755,293.9** **Rev: DRAFT**
Ground level: 76.59m O.D.	**DATE: 1.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 1.50m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.80 * 4.20m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							75.44	1.15	Plastic black amorphous PEAT.
1			VANE	1.00	33mm vane used 24 kN/m²				
							75.09	1.50	Firm yellowish brown fibrous PEAT. H3 B2 F2 W1 TV0 TH0.
			B 1	1.50-1.70			74.89	1.70	Soft light grey organic SILT.
			D 2	1.50-1.70					Soft wet light bluish grey slightly gravelly sandy SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to rounded.
2									
									2.80m: firm
3			B 3	3.00-3.20					
			D 4	3.00-3.20			73.09	3.50	
									Firm wet light bluish grey slightly gravelly sandy SILT with high cobble content and medium boulder content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to rounded. Boulders are subrounded.
4							72.49	4.10	
						END			TP terminated at 4.10m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 1.50m bgl. TP backfilled with arisings.

Scale: 1:50

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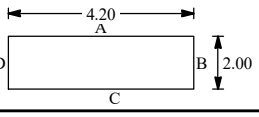
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-12**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,641.2 N 755,255.6**	**Rev: DRAFT**
Ground level: 74.83m O.D.		**DATE: 3.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 0.00m
2nd: 1.60m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.20m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									Heather over firm orangish brown fibrous PEAT. H2.
			VANE	0.80	33mm vane used 15 kN/m²				0.70m: yellowish brown.
1									
							73.18	1.65	
			B 1 D 2	1.80-2.00 1.80-2.00					Stiff bluish grey slightly gravelly sandy SILT with decaying organic material. Gravel is angular to subangular fine to medium. 2.00m to 3.90m: with low boulder content. Boulders are subrounded of limestone. Boulders are up to 600mm in length.
2									
3			B 3 D 4	3.00-3.20 3.00-3.20					3.00m: firm.
							70.93	3.90	
4			B 5	4.00-4.20					Firm light slightly gravelly SILT. Gravel is subangular to rounded fine to coarse.
							70.33	4.50	
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water from g/l to 1.65m bgl. Seepage of water at 1.60m bgl. TP backfilled with arisings.

Scale: 1:50

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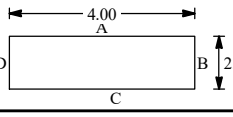
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-13**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,775.2 N 755,272.6** **Rev: DRAFT**
Ground level: 74.62m O.D.	**DATE: 4.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							74.52	0.10	Plastic black amorphous PEAT.
									Firm orangish brown fibrous PEAT. H2 B2 F3 R1 W0 TV0 TH0.
			VANE	0.70	33mm vane used 13 kN/m²				
1							72.82	1.80	
							72.67	1.95	Soft light brown slightly sandy SILT.
2			B 1 D 2	2.00-2.20 2.00-2.20					Firm grey sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to subrounded.
							72.22	2.40	Soft light grey slightly sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular.
3			B 3 D 4	3.00-3.20 3.00-3.20					
							70.92	3.70	Firm bluish grey slightly gravelly sandy SILT.
4			B 5	4.00-4.20					
							70.12	4.50	
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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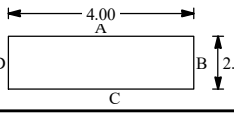
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-14**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,706.0 N 755,242.9**	**Rev: DRAFT**
Ground level: 74.92m O.D.		**DATE: 2.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 0.00m
2nd: 3.40m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							74.42	0.50	Spongy brown pseudo fibrous PEAT. H7.
1			VANE	1.00	33mm vane used 17 kN/m²		73.02	1.90	Firm orangish brown fibrous PEAT. H2 B2 F2 R1 W1 TV0 TH0.
2			B 1 D 2	2.20-2.40 2.20-2.40			72.92	2.00	Firm light grey organic SILT.
3			B 3	3.40-3.60			70.92	4.00	Stiff dark grey slightly sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular. 3.20m: firm.
4						END			TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse and ingress of water.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water from g/l to 1.90m bgl. Rapid ingress of water at 3.40m bgl. TP backfilled with arisings.

Scale: 1:50

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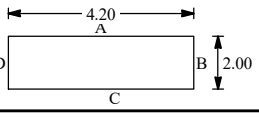
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-15**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**
ENGINEER: FTCO/MKO	**E 663,673.0 N 755,210.9**
Rig: Zaxis 120	
Rev: DRAFT	
Ground level: 74.89m O.D.	**DATE: 3.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 2.40m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.20m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							74.39	0.50	Spongy brown pseudo fibrous PEAT.
1			VANE B 1	1.00 1.00-1.20	33mm vane used 13 kN/m²		72.49	2.40	Firm yellowish brown fibrous PEAT. H2 F3 R2 W1 TV0 TH0.
2		▼							
3			B 2 D 3	2.50-2.70 2.50-2.70			71.49	3.40	Stiff dark grey SILT with decaying organic material.
4			B 4 D 5	3.80-4.00 3.80-4.00			70.39	4.50	Stiff grey sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular.
5						END			TP terminated at 4.50m bgl on REs instruction.
6									
7									
8									
9									
10									

Remarks: Seepage of water at 2.40m bgl. TP backfilled with arisings.

Scale: 1:50

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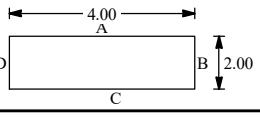
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-17**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**
ENGINEER: FTCO/MKO	**E 663,612.1 N 755,194.7**
Rig: Zaxis 120	
Rev: DRAFT	
Ground level: 74.39m O.D.	**DATE: 3.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: **0.00m**
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0		▼							
									Firm brown fibrous PEAT. H2 B2 F3 R2 W1 TV0 TH0.
1									
							72.89	1.50	
						END			TP terminated at 1.50m bgl. Unable to progress TP due to ingress of surface water.
2									
3									
4									
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of surface water. TP backfilled with arisings.

Scale: 1:50

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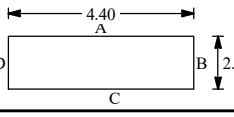
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-18**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,626.6 N 755,135.9**	**Rev: DRAFT**
Ground level: 74.90m O.D.		**DATE: 3.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 0.00m
2nd: 2.00m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.40m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							74.40	0.50	Grass over plastic black amorphous PEAT.
1							72.90	2.00	Firm yellowish and orangish brown fibrous PEAT with 'bog oak'. H3 B2 F3 R2 W2 TV0 TH0.
2			B 1 D 2	2.20-2.40 2.20-2.40			72.50	2.40	Stiff grey sandy SILT with rootlets.
3			B 3	3.20-3.40			70.90	4.00	Dark grey very silty very sandy angular to subangular fine to medium and coarse GRAVEL with high cobble content.
4							70.70	4.20	Firm wet grey sandy gravelly SILT with high cobble content. Cobbles are angular.
						END			TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water from g/l to 2.00m bgl. Rapid ingress of water at 2.00m bgl. TP backfilled with arisings.

Scale: 1:50

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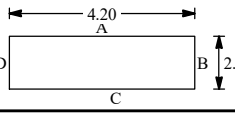
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-20**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,726.2 N 755,198.3**	**Rev: DRAFT**
Ground level: 74.99m O.D.		**DATE: 2.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 0.00m
2nd: 2.20m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.20m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							74.44	0.55	Heather over plastic brownish black amorphous PEAT.
									Firm orangish brown fibrous PEAT. H3 B2 F3 R2 W2 TV0 TH0.
1			VANE	1.00	33mm vane used 16 kN/m²				
			B 1	1.30-1.50					
2							72.79	2.20	
			B 2	2.40-2.60					Stiff dark grey slightly sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular.
			D 3	2.40-2.60					
3							71.49	3.50	
						END			TP terminated at 3.50m bgl. Unable to progress TP - sidewall collapse.
4									
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water from g/l to 2.20m bgl. Ingress of water at 2.20m bgl. TP backfilled with arisings.

Scale: 1:50

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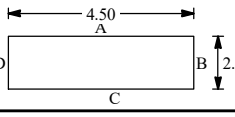
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-22**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** E 663,817.4 N 755,166.5 — **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**Rev: DRAFT**
Ground level: 77.19m O.D.	**DATE: 1.2.21**

GROUNDWATER

Water strikes: Rose to after:
1st: 2.30m
2nd: 4.10m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							76.69	0.50	Plastic black amorphous PEAT.
							74.89	2.30	Firm orangish brown fibrous PEAT. H3 B2 F3 R2 W2 TV0 TH0.
		1					74.69	2.50	Firm whitish grey gravelly SILT. Gravel is subangular fine to coarse.
			B 1 D 2	2.50-2.70 2.50-2.70					Firm bluish grey gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular.
									3.50m: with boulders.
		2	B 3	4.20-4.40			72.69	4.50	
						END			TP terminated at 4.50m bgl on REs instruction.

Remarks: Seepage of water at 2.30m bgl. Ingress of water at 4.10m bgl. TP backfilled with arisings.

Scale: 1:50

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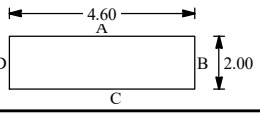
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-23**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,757.2 N 7,551,112.1** **Rev: DRAFT**
Ground level: 76.44m O.D.	**DATE: 2.2.21**

GROUNDWATER
Water strikes: Rose to after:
1st: 2.00m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.60m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							75.79	0.65	Heather over plastic brown amorphous PEAT.
1			B 1	1.00-1.20					Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W2 TV0 TH0.
2		▼					74.44	2.00	
							73.94	2.50	Soft brownish grey peaty SILT.
			B 2 D 3	2.50-2.70 2.50-2.70					Soft damp bluish grey slightly sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. 2.80: firm. 3.30m: with medium boulder content. Boulders are up to 400mm in length.
4							72.24	4.20	
						END			TP terminated at 4.20m bgl. Obstruction as boulders.
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 2.00m bgl. TP backfilled with arisings.

Scale: 1:50

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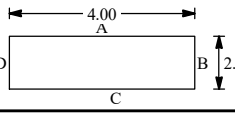
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-24**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,659.4 N 755,080.0** **Rev: DRAFT**
Ground level: 74.93m O.D.	**DATE: 3.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 0.00m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							74.48	0.45	Grass over plastic black amorphous PEAT.
1			VANE	1.00	33mm vane used 14 kN/m²		72.93	2.00	Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W1 TV0 TH0.
2			B 1 D 2	2.10-2.30 2.10-2.30			72.23	2.70	Stiff dark grey sandy gravelly SILT with decaying organic material. Gravel is angular to subrounded fine to coarse.
3			B 3 D 4	3.30-3.50 3.30-3.50			70.93	4.00	Soft bluish grey sandy gravelly SILT with high cobble content. Gravel is angular to rounded fine to coarse. cobbles are subangular. 3.30-3.50m: dark grey very sandy very silty GRAVEL.
4						END			TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water from g/l to 2.00m bgl. TP backfilled with arisings.

Scale: 1:50

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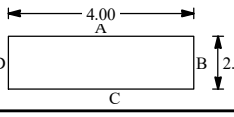
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-25**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**
ENGINEER: FTCO/MKO	**E 663,582.7 N 755,281.6**
Ground level: 74.68m O.D.	**Rig: Zaxis 120**
	Rev: DRAFT
	DATE: 3.2.21

GROUNDWATER

Water strikes: **Rose to after:**
1st: 1.50m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
			VANE	1.00	33mm vane used 12 kN/m²		73.18	1.50	Heather over firm orangish and yellowish brown fibrous PEAT. H2 B2 F3 R2 W1 TV0 TH0.
1		▼1							
			B 1 D 2	1.70-1.90 1.70-1.90			72.28	2.40	Stiff dark bluish grey slightly gravelly sandy SILT with medium cobble content. Gravel is angular to subrounded fine to coarse. Cobbles are angular.
2									
			B 3	2.80-3.00			71.68	3.00	Dark grey silty very gravelly medium to coarse SAND. Gravel is angular to subrounded fine to coarse.
3							71.18	3.50	Stiff dark grey slightly gravelly SILT with high cobble content and boulders. Gravel is subangular to subrounded fine to coarse. Cobbles are angular. Boulders are subangular to rounded.
						END			TP terminated at 3.50m bgl. Unable to progress TP - sidewall collapse.
4									
5									
6									
7									
8									
9									
10									

Remarks: Ingress of surface water. Rapid ingress of water at 1.50m bgl. TP backfilled with arisings.

Scale: 1:50

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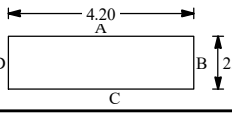
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-26**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,605.5 N 755,231.3** **Rev: DRAFT**
Ground level: 74.62m O.D.	**DATE: 3.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 3.80m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.20m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							74.07	0.55	Grass and heather over plastic black amorphous PEAT.
							73.42	1.20	Firm orangish brown fibrous PEAT. H2 B2 F3 R1 W1 TV0 TH0.
1									
							72.52	2.10	Spongy brown fibrous PEAT. H4 B2 F2 R2 W2 TV0 TH0.
2			B 1 D 2	2.20-2.40 2.20-2.40					Stiff dark grey slightly gravelly sandy SILT. Gravel is angular to subangular fine to coarse.
3			B 3 D 4	3.40-3.60 3.40-3.60			70.82	3.80	
		1					70.62	4.00	Dark grey sandy subrounded to rounded fine to coarse GRAVEL.
4									**END** TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 3.80m bgl. TP backfilled with arisings.

Scale: 1:50

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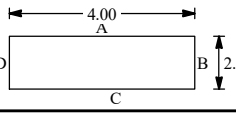
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-27**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,528.5 N 755,204.7** **Rev: DRAFT**
Ground level: 74.97m O.D.	**DATE: 3.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 0.00m
2nd: 2.10m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							74.32	0.65	Heather over plastic brownish black amorphous PEAT.
1									Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W2 TV0 TH0.
			B 1	1.40-1.60					
2							72.87	2.10	
			B 2	2.40-2.60					Dark grey sandy subangular fine to coarse GRAVEL. Sand is coarse.
3							71.97	3.00	
									Wet dark grey gravelly coarse SAND.
4							70.97	4.00	
						END			TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water from g/l to 2.10m bgl. Ingress of water at 2.10m bgl. TP backfilled with arisings.

Scale: 1:50

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TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

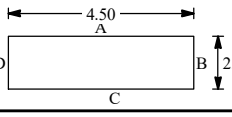
PROJECT: Ballivor Wind Farm
LOCATION: Ballivor, Co. Meath
TRIALPIT: TP-28
Sheet 1 of 1

CLIENT: Bord na Mona
ENGINEER: FTCO/MKO
Co-ordinates: E 663,501.8 N 755,164.4
Rig: Zaxis 120
Rev: DRAFT

Ground level: 74.64m O.D.
DATE: 3.2.21

GROUNDWATER
Water strikes: Rose to after:
1st: 0.50m
2nd: 1.90m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0		1							
			B 1	0.60-0.80			74.04	0.60	Plastic black amorphous PEAT.
			VANE	0.90	33mm vane used 13 kN/m²				Firm yellowish brown fibrous PEAT. H2 B2 F3 R2 W1 TV0 TH0.
1							73.14	1.50	
		2	B 2	1.60-1.80					Stiff grey sandy gravelly SILT with high cobble content. Gravel is subangular to rounded fine to coarse. Cobbles are subrounded.
			D 3	1.60-1.80			72.74	1.90	
2									Grey sandy subrounded to rounded fine to coarse GRAVEL with high cobble content.
			B 4	2.60-2.80					
3									
							70.84	3.80	
			B 5	3.80-4.00			70.64	4.00	Grey SAND.
4						END			TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 0.50m bgl. Rapid ingress of water at 1.90m bgl. TP backfilled with arisings.

Scale: 1:50

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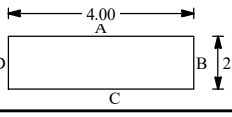
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-29**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** E 663,582.4 N 755,102.2
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 74.97m O.D.	**Rev: DRAFT**
	DATE: 3.2.21

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 270-090
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse after 20 minutes.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							74.37	0.60	Plastic black amorphous PEAT.
1									Firm orangish black fibrous PEAT. H3 B2 F2 R0 W2 TV0 TH0.
2							72.67	2.30	
							72.52	2.45	Stiff light grey sandy SILT. Sand is fine.
			B 1 B 2	2.60-2.80 2.60-2.80					Stiff light bluish grey slightly gravelly sandy silty CLAY with medium cobble content. Gravel is angular to rounded fine to coarse. Cobbles are subangular.
3									3.10m: firm.
			D 3 B 4	3.40-3.60 3.40-3.60					3.60m: locally soft.
4							70.47	4.50	
							END		TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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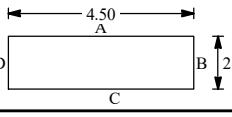
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-A**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 665,798.9 N 752,202.6**	**Rev: DRAFT**
Ground level: 71.93m O.D.		**DATE: 5.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 3.00m
2nd: 4.20m
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.00m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							71.83	0.10	Spongy black pseudo fibrous PEAT.
									Firm orangish brown fibrous PEAT. H2.
1			VANE	0.90	33mm vane used 15 kN/m²				
							70.33	1.60	
									Spongy brown pseudo fibrous PEAT. H4 B2 F2 R2 W3 TV0 TH0.
2			B 1	2.00-2.20					
							69.43	2.50	
							69.23	2.70	Firm greenish brown slightly sandy slightly gravelly SILT.
			B 2	2.70-2.90					Firm light grey slightly gravelly sandy SILT. Gravel is subrounded fine to coarse.
3		1	D 3	2.70-2.90			68.93	3.00	
			B 4	3.00-3.20					Grey medium SAND.
							68.33	3.60	
									Grey medium SAND with medium cobble content. Cobbles are angular to rounded.
4		2					67.43	4.50	
							END		TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water at 3.00m bgl. Ingress of water at 4.20m bgl. TP backfilled with arisings.

Scale: 1:50

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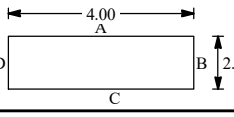
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-B**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 665,165.1 N 753,511.5**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 74.92m O.D.	**Rev: DRAFT**
	DATE: 8.2.21

GROUNDWATER

Water strikes: **Rose to after:**
1st: 3.00m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							74.42	0.50	Firm brownish black pseudo fibrous PEAT.
1			VANE	1.00	33mm vane used 13 kN/m²				Firm orangish brown fibrous PEAT. H2 B2 F3 R3 W2 TV0 TH0.
2			B 1 D 2	2.40-2.60 2.40-2.60			72.57	2.35	Stiff greenish grey slightly sandy gravelly SILT with decaying organic material. Gravel is angular to subrounded fine to coarse.
3		▼1	B 3 D 4	3.70-3.90 3.70-3.90			72.12	2.80	Stiff wet light grey slightly sandy gravelly SILT with low cobble content. Gravel is angular to rounded fine to coarse. Cobbles are subangular. 3.60m: firm.
4						END	70.92	4.00	TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water at 3.00m bgl. TP backfilled with arisings.

Scale: 1:50

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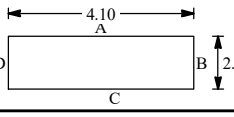
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-C**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 663,975.5 N 753,121.6**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 74.11m O.D.	**Rev: DRAFT**
	DATE: 4.2.21

GROUNDWATER

Water strikes: **Rose to after:**
1st: 3.00m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.10m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.00m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							73.41	0.70	Plastic black amorphous PEAT.
			VANE	0.80	33mm vane used 40 kN/m²		73.01	1.10	Firm orangish black fibrous PEAT. H3 B1 F2 R2 W1 TV0 TH0.
1			B 1 D 2	1.20-1.40 1.20-1.40			72.71	1.40	Firm light brown gravelly SILT with rootlets. Gravel is angular to subrounded fine to coarse.
							72.16	1.95	Grey medium to coarse SAND.
2			B 3 D 4	2.50-2.70 2.50-2.70			71.11	3.00	Soft bluish brown sandy gravelly SILT with medium cobble content. Gravel is angular to subrounded fine to coarse. Cobbles are subrounded. 2.50-2.70m: Grey very gravelly very silty SAND.
3		▼1					70.51	3.60	Wet light brownish grey silty gravelly fine to medium SAND with medium cobble content. Cobbles are subrounded.
						END			TP terminated at 3.60m bgl. Unable to progress TP - sidewall collapse.
4									
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 3.00m bgl. TP backfilled with arisings.

Scale: 1:50

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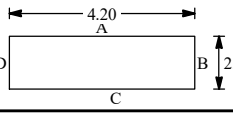
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-D**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 664,329.3 N 753,718.9**	**Rev: DRAFT**
Ground level: 77.20m O.D.		**DATE: 4.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.20m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
									Heather over firm brown fibrous PEAT. H2 B3 F3 R2 W3 TV0 TH0 A2.
1			VANE	1.00	33mm vane used 14 kN/m²				
			B 1	1.60-1.80					
2									
3							73.70	3.50	
						END			TP terminated at 3.50m bgl. Unable to progress TP - sidewall collapse.
4									
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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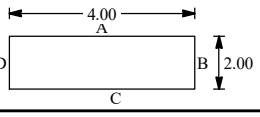
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-E**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 663,784.3 N 752,452.3**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 72.86m O.D.	**Rev: DRAFT**
	DATE: 5.2.21

GROUNDWATER

Water strikes: Rose to after:
1st: 2.00m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							72.21	0.65	Grass over spongy brown pseudo fibrous PEAT. H6.
			VANE	0.80	33mm vane used 16 kN/m²		71.76	1.10	Firm orangish brown fibrous PEAT. H2 B2 F3 R1 W0 TV0 TH0.
1									
							70.81	2.05	Spongy brown pseudo fibrous PEAT. H4 B2 F1 R2 W3 TV0 TH0.
2			B 1 D 2	2.05-2.25 2.05-2.25			70.61	2.25	Stiff brown slightly gravelly slightly sandy organic SILT with decaying organic material. Gravel is angular to subangular fine to coarse.
									Stiff grey sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to subrounded.
3			B 3 D 4	3.10-3.30 3.10-3.30					3.20m to 3.60m: firm wet with increase in cobble content.
									3.60m to 4.50m: soft.
4							68.36	4.50	
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 2.00m bgl. TP backfilled with arisings.

Scale: 1:50

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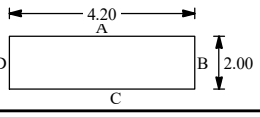
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-F**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 664,502.3 N 752,692.1**	**Rev: DRAFT**
Ground level: 71.40m O.D.		**DATE: 8.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.20m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							70.90	0.50	Plastic blackish brown amorphous PEAT. H8.
							70.40	1.00	Firm orangish brown fibrous PEAT. H2 B3 F3 R2 W2 TV0 TH0.
1			VANE	1.00	33mm vane 15 kN/m²				Spongy brown pseudo fibrous PEAT. H4 B2 F3 R3 W2 TV0 TH0.
2							69.30	2.10	
			B 1 D 2	2.30-2.50 2.30-2.50			68.30	3.10	Stiff grey slightly gravelly slightly sandy SILT with medium cobble content and decaying organic material. Gravel is angular to subangular fine to coarse. Cobbles are subrounded.
3							68.15	3.25	Grey coarse SAND.
			B 3 D 4	3.30-3.50 3.30-3.50			66.90	4.50	Firm damp light grey sandy gravelly SILT with high cobble content. Gravel is subangular to rounded fine to coarse. Cobbles are subrounded. 3.60m to 4.50m: stiff.
4									
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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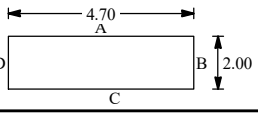
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-G**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 665,463.9 N 759,852.1** **Rev: DRAFT**
Ground level: 74.64m O.D.	**DATE: 11.2.21**

GROUNDWATER
Water strikes: **Rose to after:**
1st: 3.80m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.70m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
									Heather over firm yellowish brown fibrous PEAT. H2 B2 F3 R2 W1 TV0 TH0.
1			VANE	0.90	33mm vane 14 kN/m²				
			B 1	1.50-1.70					
2							72.14	2.50	
									Spongy brown pseudo fibrous PEAT. H5 B1 F1 R3 W3 TV0 TH0.
3							71.29	3.35	
							71.14	3.50	Yellowish brown silty angular to subangular fine to coarse GRAVEL.
		▼1							Light grey silty sandy angular to rounded fine to coarse GRAVEL with high cobble content.
4			B 2	3.80-4.00			70.04	4.60	
						END			TP terminated at 4.60m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 3.80m bgl. TP backfilled with arisings.

Scale: 1:50

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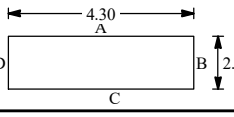
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-H**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 664,023.0 N 759,552.9** **Rev: DRAFT**
Ground level: 74.54m O.D.	**DATE: 11.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 4.00m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.30m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
									Heather over firm brown fibrous PEAT. H3 B2 F2 R3 W2 TV0 TH0.
1			VANE	1.00	33mm vane 16 kN/m²		73.14	1.40	
			B 1 D 2	1.50-1.70 1.50-1.70			72.84	1.70	Firm grey gravelly SILT with high cobble content. Gravel is angular fine to coarse. Cobbles are angular.
2							72.44	2.10	Grey silty sandy angular to subangular fine to coarse GRAVEL. Sand is coarse.
			B 3 B 4	2.30-2.50 2.30-2.50					Grey silty gravelly medium to coarse SAND.
3									
		▼1					70.54	4.00	
4						END			TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 2.10m bgl. TP backfilled with arisings.

Scale: 1:50

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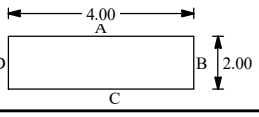
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-I**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 664,745.0 N 759,718.2** **Rev: DRAFT**
Ground level: 73.87m O.D.	**DATE: 10.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 3.10m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
									Heather over soft brownish black pseudo fibrous PEAT. H6 B2 F2 R3 W3 TV0 TH0.
1			VANE	1.00	33mm vane used 15 kN/m²				
2			B 1	2.00-2.20					
3		▼					70.77	3.10	
							70.57	3.30	Greenish grey silty angular coarse GRAVEL.
			B 2	3.50-3.70					Wet grey slightly silty very sandy medium and coarse GRAVEL.
4							69.37	4.50	
							END		TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 3.10m bgl. TP backfilled with arisings.

Scale: 1:50

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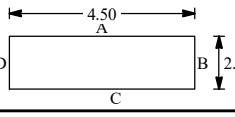
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-J**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**
ENGINEER: FTCO/MKO	**E 665,027.7 N 759,172.2**
Rig: Zaxis 120	
Rev: DRAFT	
Ground level: 72.38m O.D.	**DATE: 10.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 2.30m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.30m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							71.83	0.55	Plastic black amorphous PEAT. H9.
1			VANE	1.00	33mm vane used 16 kN/m²				Spongy brown pseudo fibrous PEAT. H5 B2 F3 R3 W1 TV0 TH0.
			B 1	1.70-1.90					
2		▼					70.08	2.30	
							69.98	2.40	Greenish grey silty sandy subangular to subrounded fine to coarse GRAVEL.
			B 2	2.70-2.90					Grey slightly silty very sandy angular to rounded fine to coarse GRAVEL with high cobble content.
3									
4							68.18	4.20	
						END			TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 2.30m bgl. TP backfilled with arisings.

Scale: 1:50

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TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

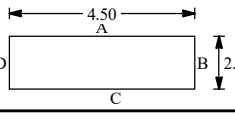
PROJECT: Ballivor Wind Farm
LOCATION: Ballivor, Co. Meath
TRIALPIT: TP-K
Sheet 1 of 1

CLIENT: Bord na Mona
ENGINEER: FTCO/MKO
Co-ordinates: E 665,884.0 N 758,544.6
Rig: Zaxis 120
Rev: DRAFT

Ground level: 71.37m O.D.
DATE: 10.2.21

GROUNDWATER
Water strikes: Rose to after:
1st: 2.20m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.20m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							71.27	0.10	Plastic black amorphous PEAT.
									Firm orangish brown fibrous PEAT. H3 B2 F3 R2 W2 TV0 TH0.
1			VANE	0.90	33mm vane used 15 kN/m²		70.17	1.20	
									Spongy brown pseudo fibrous PEAT. H4 B2 F2 R3 W2 TV0 TH0.
2		▼	B 1	2.00-2.20			69.37	2.00	
							69.27	2.10	Stiff brownish grey gravelly SILT with rootlets. Gravel is subrounded fine to coarse.
									Dark grey slightly silty very sandy angular to rounded fine to coarse GRAVEL with low cobble content.
3			B 2	2.80-3.00					
			B 3	3.80-4.00					
4							67.17	4.20	
						END			TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 2.20m bgl. TP backfilled with arisings.

Scale: 1:50

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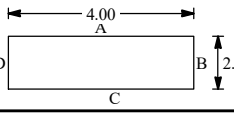
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-L**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**
ENGINEER: FTCO/MKO	**E 664,274.1 N 759,053.6**
Rig: Zaxis 120	
Rev: DRAFT	
Ground level: 72.70m O.D.	**DATE: 10.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 1.40m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 1.40m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							72.55	0.15	Plastic black amorphous PEAT.
									Spongy brown pseudo fibrous PEAT. H4 B1 F3 R3 W2 TV0 TH0.
							71.85	0.85	
1			B 1 D 2	0.90-1.10 0.90-1.10			71.55	1.15	Stiff whitish grey gravelly SILT with rootlets. Gravel is angular to subangular fine to coarse.
		1					71.30	1.40	Light bluish grey silty sandy GRAVEL.
									Wet grey coarse SAND and subangular to subrounded fine to coarse GRAVEL.
2			B 3	2.00-2.20			70.70	2.00	
									Wet grey slightly gravelly silty fine to coarse SAND.
3									
							69.00	3.70	
							END		TP terminated at 3.70m bgl. Unable to progress TP - sidewall collapse.
4									
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 1.40m bgl. TP backfilled with arisings.

Scale: 1:50

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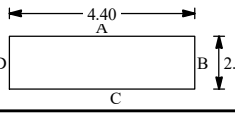
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-M**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 665,121.5 N 758,495.4**	**Rev: DRAFT**
Ground level: 70.69m O.D.		**DATE: 10.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 2.80m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.40m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.00m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							70.19	0.50	Spongy black pseudo fibrous PEAT. H7.
1			VANE	1.20	33mm vane used 17 kN/m²				Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W2 TV0 TH0.
			B 1	1.60-1.80			68.89	1.80	
2									Spongy dark brown pseudo fibrous PEAT. H4 B2 F2 R3 W2 TV0 TH0.
		1					67.89	2.80	
						× ×	67.74	2.95	Soft green organic SILT.
3			B 2	3.10-3.30					Dark grey silty very sandy angular to rounded fine to coarse GRAVEL with high cobble content.
4							66.19	4.50	
						END			TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 2.80m bgl. TP backfilled with arisings.

Scale: 1:50

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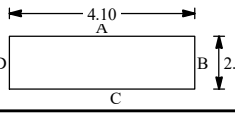
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-N**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 665,985.7 N 752,968.1**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 73.56m O.D.	**Rev: DRAFT**
	DATE: 8.2.21

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.10m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							73.41	0.15	Rushes over spongy black pseudo fibrous PEAT. H7.
									Firm orangish brown fibrous PEAT. H2 B3 F3 R2 W2 TV0 TH0.
							72.71	0.85	
1			VANE	1.00	33mm vane used 49 kN/m²				Soft greenish grey slightly sandy slightly gravelly SILT with medium cobble content. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded.
			B 1	1.10-1.30					
			D 2	1.10-1.30			72.06	1.50	
2									Firm light grey slightly sandy slightly gravelly silty CLAY with medium cobble content and medium boulder content. Gravel is subangular to rounded fine to coarse. Cobbles are rounded. Boulders are subangular to rounded. Boulders are up to 600mm in length.
			B 3	2.50-2.70					
			D 4	2.50-2.70					
3									
			B 5	3.60-3.80					
4							69.36	4.20	
						END			TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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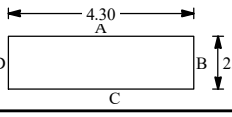
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-O**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 664,622.2 N 752,005.8** **Rev: DRAFT**
Ground level: 72.75m O.D.	**DATE: 5.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.30m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse after 20 minutes.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							72.30	0.45	Spongy brown pseudo fibrous PEAT. H6.
1			VANE B 1	0.90 1.00-1.20	33mm vane used 15 kN/m²		71.45	1.30	Firm orangish brown fibrous PEAT. H2 B3 F3 R1 W1 TV0 TH0.
2							69.85	2.90	Firm brown fibrous PEAT. H3 B2 F3 R1 W1 TV0 TH0.
3			B 2 D 3	3.00-3.20 3.00-3.20			69.25	3.50	Stiff greenish grey slightly sandy gravelly SILT with rootlets. Gravel is angular to subangular fine to coarse.
4			B 4 D 5	4.00-4.20 4.00-4.20			68.15	4.60	Firm grey sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subrounded. 3.80m to 4.60m: soft and wet.
5						END			TP terminated at 4.60m bgl on REs instruction.
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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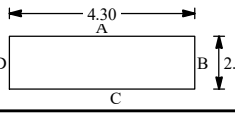
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-P**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 665,927.4 N 751,694.3**	**Rev: DRAFT**
Ground level: 69.97m O.D.		**DATE: 5.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.30m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse after 20 minutes.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							69.82	0.15	Firm black PEAT.
									Firm orangish brown fibrous PEAT. H2 B2 F2 R2 W2 TV0 TH0.
1			VANE	0.80	33mm vane used 10 kN/m²				
			B 1	1.50-1.70					
2									
3									
4							65.57	4.40	
			B 2	4.40-4.50		× ×	65.47	4.50	Brown peaty SILT.
						END			TP terminated at 4.50m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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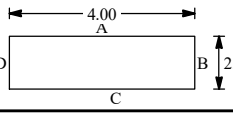
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-Q**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 662,594.9 N 757,805.4**	**Rev: DRAFT**
Ground level: 76.84m O.D.		**DATE: 9.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 1.10m 20min 1.00m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from g/l to 2.10m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							76.64	0.20	Heather over plastic black amorphous PEAT.
									Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W3 TV0 TH0.
1		1	VANE 1 B 1	1.00 1.00-1.20	33mm vane used 13 kN/m²		75.84	1.00	
									Firm brown fibrous PEAT. H3 B2 F3 R3 W2 TV0 TH0.
2							74.74	2.10	
			B 2 D 3	2.20-2.40 2.20-2.40					Stiff bluish grey slightly sandy slightly gravelly silty CLAY with medium cobble content and rootlets. Gravel is angular to subrounded fine to coarse. 2.50m to 2.80m: soft and wet.
							74.04	2.80	
3						END			TP terminated at 2.80m bgl. Unable to progress TP - sidewall collapse.
4									
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 2.10m bgl. TP backfilled with arisings.

Scale: 1:50

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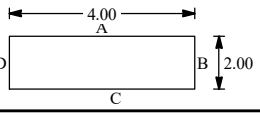
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-R**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 661,507.8 N 757,054.4**	**Rev: DRAFT**
Ground level: 75.82m O.D.		**DATE: 9.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: 4.40m 10min 4.25m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							75.52	0.30	Heather over plastic black amorphous PEAT.
							75.02	0.80	Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W3 TV0 TH0.
1			VANE	0.90	33mm vane used 14 kN/m²				Spongy brown pseudo fibrous PEAT. H4 B2 F2 R3 W2 TV0 TH0. Pungent odour.
2									
3									
4		1					71.42	4.40	
			B 1 D 2	4.40-4.60 4.40-4.60			71.12	4.70	Stiff dark grey silty CLAY.
						END			TP terminated at 4.70m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 4.40m bgl. TP backfilled with arisings.

Scale: 1:50

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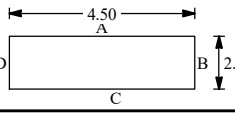
PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-S**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 662,005.8 N 756,798.2**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 77.78m O.D.	**Rev: DRAFT**
	DATE: 9.2.21

GROUNDWATER

Water strikes:		Rose to after:	
1st:	1.50m		
2nd:	2.00m	10min	1.20m
3rd:			

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							76.88	0.90	Grass and heather over spongy black pseudo fibrous PEAT. H6.
1		1	B 1	1.00-1.20	33mm vane used 40 kN/m²				
			D 2	1.00-1.20			76.58	1.20	Firm greenish grey slightly gravelly slightly sandy SILT with rootlets. Gravel is angular to subangular fine to coarse.
		1	VANE	1.10					
							76.18	1.60	Firm bluish grey gravelly SILT. Gravel is angular to rounded fine to coarse.
			B 3	1.60-1.80					
2		2					75.38	2.40	Dark grey sandy angular to subangular fine to coarse GRAVEL with high cobble content and high boulder content. Sand is coarse. Cobbles are subrounded. Boulders are subrounded. Boulders are up to 800mm in length.
									Large limestone BOULDERS with cobble infill. Boulders are up to 1000mm in length. Hard digging.
3							74.38	3.40	
			B 4	3.60-3.80					Dark grey silty very sandy subrounded fine to coarse GRAVEL with high cobble content and medium boulder content. Cobbles are subangular to subrounded. Boulders are subangular to subrounded. Boulders are up to 600mm in length.
4							73.58	4.20	
						END			TP terminated at 4.20m bgl. Obstruction as boulders.
5									
6									
7									
8									
9									
10									

Remarks: Seepage of water at 1.50m bgl. Ingress of water at 2.00m bgl. TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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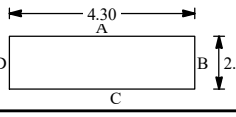
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-T**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 663,486.6 N 757,468.3**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 74.01m O.D.	**Rev: DRAFT**
	DATE: 9.2.21

GROUNDWATER
Water strikes: Rose to after:
1st: 1.20m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.30m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 1.20m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							73.21	0.80	Rushes over spongy black pseudo fibrous PEAT. H7.
1			VANE	1.00	33mm vane used 15 kN/m²		72.81	1.20	Spongy brownish black pseudo fibrous PEAT. H5 B2 F1 R2 W2 TV0 TH0 A2.
			B 1 D 2	1.30-1.50 1.30-1.50			72.71	1.30	Soft green sandy SILT with rootlets. Firm bluish grey sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to subrounded.
2									2.00m: stiff light grey. 2.20m: with low boulder content. Boulders are subrounded.
3			B 3 D 4	2.80-3.00 2.80-3.00			70.41	3.60	
			B 5 D 6	3.80-4.00 3.80-4.00					Stiff dark grey slightly sandy SILT with high cobble content and high boulder content. Cobbles are subrounded. Boulders are subrounded. Boulders are up to 650mm in length.
4							69.61	4.40	
						END			TP terminated at 4.40m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 1.20m bgl. TP backfilled with arisings.

Scale: 1:50

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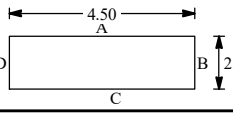
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-U**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:** **Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 662,765.2 N 757,323.0** **Rev: DRAFT**
Ground level: 74.15m O.D.	**DATE: 9.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							73.90	0.25	Heather over plastic black amorphous PEAT.
									Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W2 TV0 TH0.
1			VANE	1.00	33mm vane used 15 kN/m²		72.55	1.60	
									Firm brown fibrous PEAT. H3 B2 F2 R3 W2 TV0 TH0.
2			B 1	2.00-2.20					
3									
4							70.05	4.10	
						END			TP terminated at 4.10m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

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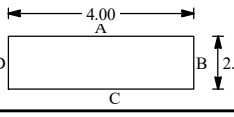
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-V**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 663,738.6 N 757,006.8**	**Rev: DRAFT**
Ground level: 71.80m O.D.		**DATE: 9.2.21**

GROUNDWATER
Water strikes: Rose to after:
1st: 2.80m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from g/l.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							71.40	0.40	Heather over soft blackish brown pseudo fibrous PEAT.
									Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W1 TV0 TH0.
1			VANE	1.00	33mm vane used 13 kN/m²		70.70	1.10	
									Spongy dark brown pseudo fibrous PEAT. H4 B1 F2 R3 W2 TV0 TH0.
2									
		1					69.00	2.80	
							68.90	2.90	Soft dark grey organic SILT.
3			B 1	3.00-3.20			68.80	3.00	Soft yellowish brown SILT.
									Grey silty very sandy subangular to subrounded medium to coarse GRAVEL with medium cobble content and medium boulder content. Cobbles are angular to rounded. Boulders are angular to rounded.
4							67.60	4.20	
						END			TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: Ingress of water at 2.80m bgl. TP backfilled with arisings.

Scale: 1:50

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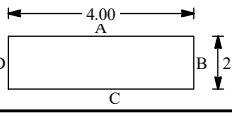
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-W**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates: E 665,734.6 N 759,326.7**
ENGINEER: FTCO/MKO	**Rig: Zaxis 120**
Ground level: 72.74m O.D.	**Rev: DRAFT**
	DATE: 10.2.21

GROUNDWATER

Water strikes: **Rose to after:**
1st: 3.60m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 4.00m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.60m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							72.49	0.25	Plastic black amorphous PEAT.
									Spongy brown pseudo fibrous PEAT. H4 B2 F3 R3 TV0 TH0.
1			VANE	1.00	33mm vane used 16 kN/m²				
2									
3							69.39	3.35	
			B 1	3.40-3.60			69.34	3.40	Soft green organic SILT.
							69.14	3.60	Greenish grey silty gravelly SAND. Gravel is subangular to subrounded fine to coarse.
4			B 2	4.00-4.20					Wet grey slightly silty sandy angular to rounded fine to coarse GRAVEL with high cobble content.
							68.24	4.50	
							END		TP terminated at 4.50m bgl on REs instruction.
5									
6									
7									
8									
9									
10									

Remarks: Rapid ingress of water at 3.60m bgl. TP backfilled with arisings.

Scale: 1:50

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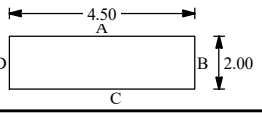
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-X**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 665,163.1 N 751,792.3**	**Rev: DRAFT**
Ground level: 72.23m O.D.		**DATE: 5.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.50m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							71.83	0.40	Plastic black amorphous PEAT.
1			VANE	1.00	33mm vane used 14 kN/m²		70.73	1.50	Firm orangish brown fibrous PEAT. H2 B2 F3 R1 W1 TV0 TH0.
2							68.43	3.80	Spongy brown pseudo fibrous PEAT. H4 B2 F2 R2 W3 TV0 TH0.
3									
4			B 1 D 2	4.10-4.30 4.10-4.30			67.73	4.50	Firm green slightly gravelly sandy SILT. Sand is fine.
5						**END**			TP terminated at 4.50m bgl on REs instruction.
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

Irish drilling LTD

Ph.
Fax

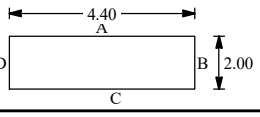
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm	**TRIALPIT: TP-Y**
LOCATION: Ballivor, Co. Meath	**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**
ENGINEER: FTCO/MKO	**E 665,230.6 N 752,587.6**
Ground level: 72.25m O.D.	**Rig: Zaxis 120**
	Rev: DRAFT
	DATE: 8.2.21

GROUNDWATER

Water strikes: **Rose to after:**
1st: **1.00m**
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.40m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit stable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							71.80	0.45	Heather over spongy dark brown pseudo fibrous PEAT. H6.
									Firm orangish brown fibrous PEAT. H2 B2 F2 R3 W2 TV0 TH0.
1			VANE	1.00	33mm vane used 13 kN/m²				
2									
3							69.25	3.00	
									Spongy brown pseudo fibrous PEAT. H5 B2 F2 R3 W2 TV0 TH0.
4			B 1	3.80-4.00					
							67.35	4.90	
5						**END**			TP terminated at 4.90m bgl on REs instruction.
6									
7									
8									
9									
10									

Remarks: Ingress of water at 1.00m bgl. TP backfilled with arisings.

Scale: 1:50

Irish drilling LTD

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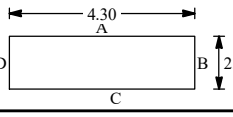
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

PROJECT: Ballivor Wind Farm		**TRIALPIT: TP-Z**
LOCATION: Ballivor, Co. Meath		**Sheet 1 of 1**
CLIENT: Bord na Mona	**Co-ordinates:**	**Rig: Zaxis 120**
ENGINEER: FTCO/MKO	**E 665,604.0 N 753,275.9**	**Rev: DRAFT**
Ground level: 73.13m O.D.		**DATE: 8.2.21**

GROUNDWATER

Water strikes: **Rose to after:**
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.00 * 4.30m
LOGGED BY: DF



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.20m to 3.80m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							72.88	0.25	Spongy black pseudo fibrous PEAT. H7.
									Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W2 TV0 TH0.
1			VANE B 1	1.00 1.00-1.20	33mm vane used 15 kN/m²		71.38	1.75	
2			B 2 D 3	1.90-2.10 1.90-2.10			70.93	2.20	Stiff greyish green slightly gravelly SILT with decaying organic material. Gravel is subangular to subrounded fine to coarse.
3			B 4	2.90-3.10			69.13	4.00	Firm wet light grey slightly gravelly sandy silty CLAY with high cobble content and low boulder content. Gravel is subangular to rounded fine to coarse. Cobbles are subrounded of limestone. Boulders are subrounded of limestone. Boulders are up to 550mm in length.
4						END			TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse.
5									
6									
7									
8									
9									
10									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:50

Irish drilling LTD

Ph.
Fax

TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

Appendix 03
Groundwater Readings

IRISH DRILLING LTD. Loughrea Co. Galway	Contract: **Ballivor Wind Farm**			
Tel: (091) 841274 Fax: (091) 880861	Date:	28.04.2021	Sheet No.	1
	Tested by:	DF	Checked:	RK

Water Levels in Standpipes

	Date		
Boreholes	**17.02.2021**	**Type**	**Remarks**
BH 02	2.02m	50mm standpipe	
BH 05	2.00m	50mm standpipe	
BH 08	0.30m	50mm standpipe	
BH 12	0.38m	50mm standpipe	
BPA BH01	DRY	50mm standpipe	
BPA BH 03A	2.45m	50mm standpipe	

Remarks:

All readings record depth from ground level to top of water level.

Appendix 04
Laboratory Test Results

Project ID	2020MH103	Client	Bord na Mona
Project Name	**Ballivor Wind Farm**	Report Date	23/04/2021 09:51
Schedule ID	2020MH103_1+2	Scheduled Date	17/2 and 22/2/21

Remarks

Sample Details							Classification						Chemical / Concrete								Compaction					Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
BH-02	0.00	1.00	B	1	04/02/21																																					
BH-02	1.00		D	2	04/02/21																																					
BH-02	1.00	1.50	B	4	04/02/21																																					
BH-02	1.50		D	5	04/02/21																																					
BH-02	2.00	2.50	B	7	04/02/21																																					
BH-02	2.50		D	8	04/02/21																																					
BH-02	3.00	3.50	B	10	04/02/21																																					
BH-02	3.50		D	11	04/02/21																																					
BH-02	4.00	4.50	B	13	04/02/21						1																															
BH-02	4.50		D	14	04/02/21																																					
BH-02	5.00	5.50	B	16	04/02/21						1																															
BH-02	5.50		D	17	04/02/21		1	1																																		
BH-02	6.50	7.00	B	19	04/02/21																																					
BH-02	7.00		D	20	04/02/21																																					
BH-02	7.10	7.30	B	22	04/02/21																																					
BH-02	7.30		D	23	04/02/21																																					
BH-04	0.00	1.00	B	1	01/02/21																																					
BH-04	1.00		D	2	01/02/21																																					
BH-04	1.00	1.50	B	4	01/02/21																																					
BH-04	1.50		D	5	01/02/21																																					
BH-04	2.00	2.45	U100	6	01/02/21																																					
BH-04	2.50		D	7	01/02/21																																					
BH-04	3.00	3.50	B	9	01/02/21																																					
BH-04	3.50		D	10	01/02/21																																					
BH-04	4.00	4.50	B	12	01/02/21						1	1																														
BH-04	4.50		D	13	01/02/21								1		1	1		1																								ALS 210414-113
BH-04	5.00	5.50	B	15	01/02/21						1																															
BH-04	5.50		D	16	01/02/21		1	1																																		
BH-04	6.50	7.00	B	18	01/02/21																																					
BH-04	7.00		D	19	01/02/21																																					
BH-05	0.00	1.00	B	1	02/02/21																																					
BH-05	1.00		D	2	02/02/21																																					
BH-05	1.00	1.45	U100	3	02/02/21																																					
BH-05	1.00	1.50	B	4	02/02/21																																					
BH-05	1.50		D	5	02/02/21																																					
BH-05	1.50	2.00	B	7	02/02/21																																					
BH-05	2.00		D	8	02/02/21																																					
BH-05	2.50	2.95	U100	9	02/02/21																																					
BH-05	3.00		D	10	02/02/21																																					
BH-05	3.50	4.00	B	12	02/02/21						1	1																														

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

Project ID	2020MH103	Client	Bord na Mona	Remarks	
Project Name	**Ballivor Wind Farm**	Report Date	23/04/2021 09:51		
Schedule ID	2020MH103_1+2	Scheduled Date	17/2 and 22/2/21		

Sample Details							Classification						Chemical / Concrete								Compaction						Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
BH-05	4.00		D	13	02/02/21		1	1																																	
BH-05	4.50	5.00	B	15	02/02/21																																				
BH-05	5.00		D	16	02/02/21								1		1	1		1																							ALS 210414-113
BH-05	5.50	6.00	B	18	02/02/21																																			
BH-05	6.00		D	19	02/02/21																																			
BH-05	6.50	7.00	B	21	02/02/21																																			
BH-05	7.00		D	22	02/02/21																																			
BH-06	0.00	1.00	B	1	03/02/21																																			
BH-06	1.00		D	2	03/02/21																																			
BH-06	1.00	1.50	B	4	03/02/21																																			
BH-06	1.50		D	5	03/02/21																																			
BH-06	2.00	2.50	B	7	03/02/21																																			
BH-06	2.50		D	8	03/02/21																																			
BH-06	3.00	3.50	B	10	03/02/21																																			
BH-06	3.50		D	11	03/02/21																																			
BH-06	4.00	4.50	B	13	03/02/21																																			
BH-06	4.50		D	14	03/02/21																																			
BH-06	5.00	5.50	B	16	03/02/21																																			
BH-06	5.50		D	17	03/02/21																																			
BH-06	6.50	7.00	B	19	03/02/21																																			
BH-06	7.00		D	20	03/02/21																																			
BH-07	0.00	1.00	B	1	03/03/21																																			
BH-07	1.00		D	2	03/03/21																																			
BH-07	1.00	1.50	B	4	03/03/21																																			
BH-07	1.50		D	5	03/03/21																																			
BH-07	2.00	2.45	U100	6	03/03/21																																			
BH-07	2.00	2.50	B	7	03/03/21																																			
BH-07	2.50		D	8	03/03/21																																			
BH-07	3.00	3.50	B	10	03/03/21						1	1																													
BH-07	3.50		D	11	03/03/21		1	1																																	
BH-07	4.00	4.50	B	13	03/03/21																																			
BH-07	4.50		D	14	03/03/21																																			
BH-07	5.00	5.50	B	16	03/03/21						1	1																													
BH-07	5.50		D	17	03/03/21		1	1																																	
BH-08	0.00	1.00	B	1	10/02/21																																			
BH-08	1.00		D	2	10/02/21																																			
BH-08	1.00	1.45	U100	3	10/02/21																																			
BH-08	1.50		D	4	10/02/21																																			
BH-08	2.00	2.50	B	6	10/02/21																																			
BH-08	2.50		D	7	10/02/21																																			
BH-08	3.00	3.50	B	9	10/02/21																																			

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

Project ID	2020MH103		Client	Bord na Mona	Remarks	
Project Name	**Ballivor Wind Farm**		Report Date	23/04/2021 09:51		
Schedule ID	2020MH103_1+2		Scheduled Date	17/2 and 22/2/21		

Sample Details							Classification						Chemical / Concrete								Compaction						Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
BH-08	3.50		D	10	10/02/21																																				
BH-08	4.00	4.50	B	12	10/02/21						1																														
BH-08	4.50		D	13	10/02/21		1	1																																
BH-08	5.00	5.50	B	15	10/02/21																																				
BH-08	5.50		D	16	10/02/21								1		1	1		1																								ALS 210414-113
BH-09	0.00	1.00	B	1	04/02/21																																				
BH-09	1.00		D	2	04/02/21																																				
BH-09	1.00	1.50	B	4	04/02/21																																				
BH-09	1.50		D	5	04/02/21																																				
BH-09	2.00	2.50	B	7	04/02/21																																				
BH-09	2.50		D	8	04/02/21																																				
BH-09	3.00	3.50	B	10	04/02/21																																				
BH-09	3.50		D	11	04/02/21								1		1	1		1																								ALS 210414-113
BH-09	4.00	4.50	B	13	04/02/21						1																														
BH-09	4.50		D	14	04/02/21		1	1																																
BH-10	0.00	1.00	B	1	05/02/21																																				
BH-10	1.00		D	2	05/02/21																																				
BH-10	1.00	1.45	U100	3	05/02/21																																				
BH-10	1.50		D	4	05/02/21																																				
BH-10	2.00	2.50	B	7	05/02/21																																				
BH-10	2.50		D	8	05/02/21																																				
BH-10	3.00	3.50	B	10	05/02/21																																				
BH-10	3.50		D	11	05/02/21																																				
BH-10	4.00	4.50	B	13	05/02/21						1																														
BH-10	4.50		D	14	05/02/21		1	1																																
BH-11	0.00	1.00	B	1	08/02/21																																				
BH-11	1.00		D	2	08/02/21																																				
BH-11	1.00	1.50	B	4	08/02/21																																				
BH-11	1.50		D	5	08/02/21																																				
BH-11	2.00	2.50	B	7	08/02/21						1	1																													
BH-11	2.50		D	8	08/02/21								1		1	1		1																								ALS 210414-113
BH-11	3.00	3.50	B	10	08/02/21																																				
BH-11	3.50		D	11	08/02/21		1	1																																
BH-11	4.00	4.50	B	13	08/02/21																																				
BH-11	4.50		D	14	08/02/21																																				
BH-11	5.00	5.50	B	16	08/02/21																																				
BH-11	5.50		D	17	08/02/21																																				
BH-12	0.00	1.00	B	1	09/02/21																																				
BH-12	1.00		D	2	09/02/21																																				
BH-12	1.00	1.50	B	4	09/02/21																																				
BH-12	1.50		D	5	09/02/21																																				

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

Project ID	2020MH103	Client	Bord na Mona	Remarks	
Project Name	**Ballivor Wind Farm**	Report Date	23/04/2021 09:51		
Schedule ID	2020MH103_1+2	Scheduled Date	17/2 and 22/2/21		

Sample Details							Classification						Chemical / Concrete									Compaction					Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
BH-12	2.00	2.50	B	7	09/02/21																																				
BH-12	2.50		D	8	09/02/21																																				
BH-12	3.00	3.50	B	10	09/02/21																																				
BH-12	3.50		D	11	09/02/21		1	1																																	
BH-12	4.00	4.50	B	13	09/02/21																																				
BH-12	4.50		D	14	09/02/21																																				
BH-13	0.00	1.00	B	1	09/02/21																																				
BH-13	1.00		D	2	09/02/21																																				
BH-13	1.00	1.50	B	4	09/02/21																																				
BH-13	1.50		D	5	09/02/21																																				
BH-13	2.00	2.45	U100	6	09/02/21																																				
BH-13	2.50		D	7	09/02/21																																				
BH-13	3.00	3.50	B	9	09/02/21						1																														
BH-13	3.50		D	10	09/02/21		1	1																																	
BH-13	4.00	4.50	B	12	09/02/21						1																														
BH-13	4.50		D	13	09/02/21																																				
BH-14	0.00	1.00	B	1	08/02/21																																				
BH-14	1.00		D	2	08/02/21																																				
BH-14	1.00	1.50	B	4	08/02/21																																				
BH-14	1.50		D	5	08/02/21																																				
BH-14	2.00	2.50	B	7	08/02/21																																				
BH-14	2.50		D	8	08/02/21																																				
BH-14	3.00	3.50	B	10	08/02/21						1																														
BH-14	3.50		D	11	08/02/21		1																																	
BH-14	4.00	4.50	B	13	08/02/21						1																														
BH-14	4.50		D	14	08/02/21		1																																	
BPA-BH01	0.00	1.00	B	1	16/02/21																																				
BPA-BH01	1.00		D	2	16/02/21																																				
BPA-BH01	1.00	1.50	B	4	16/02/21																																				
BPA-BH01	1.50		D	5	16/02/21																																				
BPA-BH01	2.00	2.50	B	7	16/02/21																																				
BPA-BH01	2.50		D	8	16/02/21																																				
BPA-BH01	3.00	3.50	B	10	16/02/21						1																														
BPA-BH01	3.50		D	11	16/02/21		1	1																																	
BPA-BH01	4.00	4.50	B	13	16/02/21						1																														
BPA-BH01	4.50		D	14	16/02/21		1	1																																	
BPA-BH02	0.00	1.00	B	1	15/02/21																																				
BPA-BH02	1.00	1.50	B	4	15/02/21						1																														
BPA-BH02	1.00		D	2	15/02/21																																				
BPA-BH02	1.50		D	5	15/02/21		1	1																																	
BPA-BH02	2.00	2.50	B	7	15/02/21						1																														

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Project ID	2020MH103		Client	Bord na Mona	Remarks	
Project Name	**Ballivor Wind Farm**		Report Date	23/04/2021 09:51		
Schedule ID	2020MH103_1+2		Scheduled Date	17/2 and 22/2/21		

Sample Details							Classification						Chemical / Concrete									Compaction						Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
BPA-BH02	2.50		D	8	15/02/21		1	1																																	
BPA-BH02	3.00	3.50	B	10	15/02/21						1																														
BPA-BH02	3.50		D	11	15/02/21		1																																	
BPA-BH02	4.00	4.50	B	13	15/02/21						1																														
BPA-BH02	4.50		D	14	15/02/21		1																																	
BPA-BH02	5.00	5.50	B	16	15/02/21						1																														
BPA-BH02	5.50		D	17	15/02/21		1																																	
BPA-BH03	0.00	1.00	B	1	15/02/21																																				
BPA-BH03	1.00		D	2	15/02/21																																				
BPA-BH03	1.00	1.50	B	4	15/02/21																																				
BPA-BH03	1.50		D	5	15/02/21																																				
BPA-BH03A	0.00	1.00	B	1	15/02/21																																				
BPA-BH03A	1.00		D	2	15/02/21								1		1	1		1																							ALS 210414-113
BPA-BH03A	1.00	1.50	B	4	15/02/21						1																														
BPA-BH03A	1.50		D	5	15/02/21		1	1																																
BPA-BH03A	2.00	2.50	B	7	15/02/21						1																														
BPA-BH03A	2.50		D	8	15/02/21		1																																	
BPA-BH03A	3.00	3.50	B	10	15/02/21						1																														
BPA-BH03A	3.50		D	11	15/02/21		1																																	
BPA-BH03A	4.00	4.50	B	13	15/02/21						1																														
BPA-BH03A	4.50		D	14	15/02/21		1																																	
BPA-TP01	3.20	3.40	B	1	12/02/21		1				1																														
BPA-TP01	4.00	4.20	B	2	12/02/21						1										1																				
BPA-TP02	1.50	1.70	D	2	12/02/21		1	1																																
BPA-TP02	1.50	1.70	B	1	12/02/21						1																														
BPA-TP02	2.50	2.70	B	3	12/02/21		1				1																														
TP-01	2.10	2.30	B	1	03/02/21																																				
TP-01	2.10	2.30	D	2	03/02/21																																				
TP-01	3.30	3.50	B	3	03/02/21																																				
TP-02	1.60	1.80	D	2	02/02/21		1	1																																
TP-02	1.60	1.80	B	1	02/02/21																																				
TP-02	2.80	3.00	B	3	02/02/21						1																														
TP-02	2.80	3.00	D	4	02/02/21																																				
TP-03	0.50	0.70	B	1	01/02/21																																				
TP-03	2.00	2.20	B	3	01/02/21								1		1	1	1																								ALS 210303-77
TP-03	2.00	2.20	D	2	01/02/21																																				
TP-03	3.20	3.40	D	4	01/02/21																																				
TP-04	1.00	1.20	B	1	04/02/21																																				
TP-04	1.70	1.90	D	3	04/02/21		1				1																														
TP-04	1.70	1.90	B	2	04/02/21																																				
TP-04	2.20	2.40	B	4	04/02/21																																				

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Project ID	2020MH103		Client	Bord na Mona	Remarks	
Project Name	**Ballivor Wind Farm**		Report Date	23/04/2021 09:51		
Schedule ID	2020MH103_1+2		Scheduled Date	17/2 and 22/2/21		

Sample Details							Classification						Chemical / Concrete									Compaction					Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
TP-05	1.80	2.00	B	1	04/02/21																																				
TP-07	1.00	1.20	B	1	01/02/21																																				
TP-07	3.60	3.80	B	2	01/02/21								1		1	1	1																								ALS 210303-77
TP-07	3.60	3.80	D	3	01/02/21																																				
TP-08	1.20	1.40	B	1	02/02/21																																				
TP-08	2.20	2.40	B	2	02/02/21		1	1			1	1																												
TP-08	2.20	2.40	D	3	02/02/21																																				
TP-08	3.60	3.80	B	4	02/02/21																			1																	
TP-08	3.60	3.80	D	5	02/02/21																																				
TP-10	2.50	2.70	B	1	04/02/21																																				
TP-10	3.50	3.70	B	2	04/02/21																																				
TP-10	3.50	3.70	D	3	04/02/21																																				
TP-11	1.50	1.70	B	1	01/02/21								1		1	1	1																								ALS 210303-77
TP-11	1.50	1.70	D	2	01/02/21																																				
TP-11	3.00	3.20	B	3	01/02/21																																				
TP-11	3.00	3.20	D	4	01/02/21																																				
TP-12	1.80	2.00	D	2	03/02/21		1	1																																
TP-12	1.80	2.00	B	1	03/02/21																			1																	
TP-12	3.00	3.20	B	3	03/02/21						1																														
TP-12	3.00	3.20	D	4	03/02/21																																				
TP-12	4.00	4.20	B	5	03/02/21																																				
TP-13	2.00	2.20	B	1	04/02/21																																				
TP-13	2.00	2.20	D	2	04/02/21																																				
TP-13	3.00	3.20	D	4	04/02/21		1	1																																
TP-13	3.00	3.20	B	3	04/02/21						1																														
TP-13	4.00	4.20	B	5	04/02/21																																				
TP-14	2.20	2.40	B	1	02/02/21								1		1	1	1																								ALS 210303-77
TP-14	2.20	2.40	D	2	02/02/21																																				
TP-14	3.40	3.60	B	3	02/02/21																																				
TP-15	1.00	1.20	B	1	03/02/21																																				
TP-15	2.50	2.70	B	2	03/02/21																																				
TP-15	2.50	2.70	D	3	03/02/21																																				
TP-15	3.80	4.00	B	4	03/02/21																																				
TP-15	3.80	4.00	D	5	03/02/21																																				
TP-18	2.20	2.40	B	1	03/02/21																																				
TP-18	2.20	2.40	D	2	03/02/21																																				
TP-18	3.20	3.40	B	3	03/02/21		1				1																														
TP-20	1.30	1.50	B	1	02/02/21																																				
TP-20	2.40	2.60	D	3	02/02/21		1	1																																
TP-20	2.40	2.60	B	2	02/02/21						1	1																													
TP-22	2.50	2.70	B	1	01/02/21																																				

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Project ID	2020MH103	Client	Bord na Mona	Remarks	
Project Name	**Ballivor Wind Farm**	Report Date	23/04/2021 09:51		
Schedule ID	2020MH103_1+2	Scheduled Date	17/2 and 22/2/21		

Sample Details							Classification						Chemical / Concrete									Compaction					Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
TP-22	2.50	2.70	D	2	01/02/21																																				
TP-22	4.20	4.40	B	3	01/02/21																																				
TP-23	1.00	1.20	B	1	02/02/21																																				
TP-23	2.50	2.70	B	2	02/02/21																																				
TP-23	2.50	2.70	D	3	02/02/21																																				
TP-24	2.10	2.30	B	1	03/02/21								1		1	1	1							1																	ALS 210303-77
TP-24	2.10	2.30	D	2	03/02/21																																				
TP-24	3.30	3.50	D	4	03/02/21		1	1																																	
TP-24	3.30	3.50	B	3	03/02/21						1																														
TP-25	1.70	1.90	D	2	03/02/21		1	1																																	
TP-25	1.70	1.90	B	1	03/02/21						1																														
TP-25	2.80	3.00	B	3	03/02/21		1				1																														
TP-26	2.20	2.40	B	1	03/02/21								1		1	1	1																								ALS 210316-78
TP-26	2.20	2.40	D	2	03/02/21		1	1																																	
TP-26	3.40	3.60	B	3	03/02/21						1	1																													
TP-26	3.40	3.60	D	4	03/02/21																																				
TP-27	1.40	1.60	B	1	03/02/21																																				
TP-27	2.40	2.60	B	2	03/02/21																																				
TP-28	0.60	0.80	B	1	03/02/21																																				
TP-28	1.60	1.80	B	2	03/02/21																																				
TP-28	1.60	1.80	D	3	03/02/21																																				
TP-28	2.60	2.80	B	4	03/02/21																																				
TP-28	3.80	4.00	B	5	03/02/21																																				
TP-29	2.60	2.80	B	2	03/02/21		1				1																														
TP-29	2.60	2.80	B	1	03/02/21																																				
TP-29	3.40	3.60	D	3	03/02/21		1	1																																	
TP-29	3.40	3.60	B	4	03/02/21																																				
TP-A	2.00	2.20	B	1	05/02/21																																				
TP-A	2.70	2.90	D	3	05/02/21		1	1																																	
TP-A	2.70	2.90	B	2	05/02/21						1																														
TP-A	3.00	3.20	B	4	05/02/21																																				
TP-B	2.40	2.60	D	2	08/02/21		1	1																																	
TP-B	2.40	2.60	B	1	08/02/21						1																														
TP-B	3.70	3.90	B	3	08/02/21								1		1	1	1	1																							ALS 210316-78
TP-B	3.70	3.90	D	4	08/02/21																																				
TP-C	1.20	1.40	B	1	04/02/21																																				
TP-C	1.20	1.40	D	2	04/02/21																																				
TP-C	1.20	1.40	B	1	04/02/21																																				
TP-C	1.20	1.40	D	2	04/02/21																																				
TP-C	2.50	2.70	D	4	04/02/21		1	1																																	
TP-C	2.50	2.70	B	3	04/02/21						1																														

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Project ID	2020MH103
Project Name	**Ballivor Wind Farm**
Schedule ID	2020MH103_1+2

Client	Bord na Mona
Report Date	23/04/2021 09:51
Scheduled Date	17/2 and 22/2/21

Remarks	

Sample Details							Classification						Chemical / Concrete								Compaction					Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
TP-C	2.50	2.70	B	3	04/02/21																																					
TP-C	2.50	2.70	D	4	04/02/21																																					
TP-D	1.60	1.80	B	1	04/02/21																																					
TP-E	2.05	2.25	D	2	05/02/21		1	1																																		
TP-E	2.05	2.25	B	1	05/02/21						1																															
TP-E	3.10	3.30	B	3	05/02/21								1		1	1	1	1																								ALS 210316-78
TP-E	3.10	3.30	D	4	05/02/21																																					
TP-F	2.30	2.50	D	2	08/02/21		1	1																																		
TP-F	2.30	2.50	B	1	08/02/21						1																															
TP-F	2.30	2.50	B	1	08/02/21																																					
TP-F	2.30	2.50	D	2	08/02/21																																					
TP-F	3.30	3.50	B	3	08/02/21																																					
TP-F	3.30	3.50	D	4	08/02/21																																					
TP-G	1.50	1.70	B	1	11/02/21																																					
TP-G	3.80	4.00	B	2	11/02/21		1				1																															
TP-H	1.50	1.70	B	1	11/02/21																																					
TP-H	1.50	1.70	D	2	11/02/21																																					
TP-H	2.30	2.50	B	3	11/02/21		1				1																															
TP-H	2.30	2.50	B	3	11/02/21																																					
TP-H	2.30	2.50	B	4	11/02/21																																					
TP-I	2.00	2.20	B	1	10/02/21																																					
TP-I	3.50	3.70	B	2	10/02/21		1				1																															
TP-J	1.70	1.90	B	1	10/02/21																																					
TP-J	2.70	2.90	B	2	10/02/21		1				1																															
TP-K	2.00	2.20	B	1	10/02/21																																					
TP-K	2.80	3.00	B	2	10/02/21																																					
TP-K	3.80	4.00	B	3	10/02/21		1				1																															
TP-L	0.90	1.10	B	1	10/02/21																																					
TP-L	0.90	1.10	D	2	10/02/21																																					
TP-L	2.00	2.20	B	3	10/02/21		1				1																															
TP-M	1.60	1.80	B	1	10/02/21																																					
TP-M	3.10	3.30	B	2	10/02/21		1				1																															
TP-N	1.10	1.30	B	1	08/02/21																																					
TP-N	1.10	1.30	D	2	08/02/21																																					
TP-N	2.50	2.70	B	3	08/02/21								1		1	1	1	1																								ALS 210316-78
TP-N	2.50	2.70	D	4	08/02/21		1	1																																		
TP-N	2.50	2.70	D	4	08/02/21																																					
TP-N	3.60	3.80	B	5	08/02/21						1																															
TP-N	3.60	3.80	B	5	08/02/21																																					
TP-O	1.00	1.20	B	1	05/02/21																																					
TP-O	3.00	3.20	D	3	05/02/21		1	1																																		

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Project ID	2020MH103		Client	Bord na Mona	Remarks	
Project Name	**Ballivor Wind Farm**		Report Date	23/04/2021 09:51		
Schedule ID	2020MH103_1+2		Scheduled Date	17/2 and 22/2/21		

Sample Details							Classification						Chemical / Concrete									Compaction						Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
TP-O	3.00	3.20	B	2	05/02/21						1																															
TP-O	4.00	4.20	B	4	05/02/21																																					
TP-O	4.00	4.20	D	5	05/02/21																																					
TP-P	1.50	1.70	B	1	05/02/21		1																																			
TP-P	1.50	1.70	B	1	05/02/21																																					
TP-P	4.40	4.50	B	2	05/02/21																																					
TP-Q	1.00	1.20	B	1	09/02/21		1																																			
TP-Q	1.00	1.20	B	1	09/02/21																																					
TP-Q	2.20	2.40	D	3	09/02/21		1	1																																		
TP-Q	2.20	2.40	B	2	09/02/21																																					
TP-Q	2.20	2.40	D	3	09/02/21																																					
TP-R	4.40	4.60	D	2	09/02/21		1	1																																		
TP-R	4.40	4.60	B	1	09/02/21																																					
TP-R	4.40	4.60	D	2	09/02/21																																					
TP-S	1.00	1.20	D	2	09/02/21		1	1																																		
TP-S	1.00	1.20	B	1	09/02/21																																					
TP-S	1.00	1.20	D	2	09/02/21																																					
TP-S	1.60	1.80	B	3	09/02/21																																					
TP-S	3.60	3.80	B	4	09/02/21		1				1																															
TP-T	1.30	1.50	B	1	09/02/21																																					
TP-T	1.30	1.50	D	2	09/02/21																																					
TP-T	2.80	3.00	B	3	09/02/21						1		1		1	1	1	1																								ALS 210316-78
TP-T	2.80	3.00	D	4	09/02/21		1	1																																	
TP-T	3.80	4.00	B	5	09/02/21																																					
TP-T	3.80	4.00	D	6	09/02/21																																					
TP-U	2.00	2.20	B	1	09/02/21																																					
TP-V	3.00	3.20	B	1	09/02/21		1				1																															
TP-W	3.40	3.60	B	1	10/02/21																																					
TP-W	4.00	4.20	B	2	10/02/21		1				1																															
TP-X	4.10	4.30	D	2	05/02/21		1	1																																	
TP-X	4.10	4.30	B	1	05/02/21						1																															
TP-X	4.10	4.30	B	1	05/02/21																																					
TP-X	4.10	4.30	D	2	05/02/21																																					
TP-Y	3.80	4.00	B	1	08/02/21		1																																			
TP-Y	3.80	4.00	B	1	08/02/21																																					
TP-Z	1.00	1.20	B	1	08/02/21		1																																			
TP-Z	1.00	1.20	B	1	08/02/21																																					
TP-Z	1.90	2.10	B	2	08/02/21								1		1	1	1	1																								ALS 210316-78
TP-Z	1.90	2.10	D	3	08/02/21						1																															
TP-Z	1.90	2.10	D	3	08/02/21																																					
TP-Z	2.90	3.10	B	4	08/02/21		1	1																																	

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

Project ID	2020MH103	Client	Bord na Mona	Remarks	
Project Name	**Ballivor Wind Farm**	Report Date	23/04/2021 09:51		
Schedule ID	2020MH103_1+2	Scheduled Date	17/2 and 22/2/21		

Sample Details							Classification						Chemical / Concrete									Compaction					Compressibility				Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	*Total Sulphur	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Press ures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	notes
TP-Z	2.90	3.10	B	4	08/02/21																																					
	Scheduled						67	39	0	0	62	8	17	0	17	17	11	11	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Completed						67	39	0	0	62	8	17	0	17	17	11	11	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

Summary of Classification Test Results

Project No.: 2020MH103

Project Name: Ballivor Wind Farm

Hole No.	Sample Ref	Top	Base	Type		Soil Description	Density bulk Mg/m3	Density dry Mg/m3	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Remarks
BH-02	17	5.50		D		Grey sandy silty coarse GRAVEL.			9.5	25					NP
BH-04	16	5.50		D		Dark grey slightly sandy gravelly SILT.			22.0	54	33	26	7		ML
BH-05	13	4.00		D		Grey slightly sandy gravelly SILT.			12.0	52	22	16	6		ML
BH-07	11	3.50		D		Grey slightly sandy gravelly silty CLAY.			12.0	48	24	16	8		CL
BH-07	17	5.50		D		Dark grey slightly sandy slightly gravelly SILT.			12.0	58	22	16	6		ML
BH-08	13	4.50		D		Dark grey slightly sandy slightly gravelly clayey SILT.			12.0	56	28	17	11		CL
BH-09	14	4.50		D		Grey slightly gravelly slightly sandy silty CLAY.			14.0	64	23	16	7		CL
BH-10	14	4.50		D		Grey very sandy very silty medium GRAVEL.			18.0	45					NP
BH-11	11	3.50		D		Grey slightly gravelly sandy silty CLAY.			23.0	53	25	16	9		CL
BH-12	11	3.50		D		Dark grey slightly gravelly slightly sandy SILT.			13.0	56	57	39	18		MH
BH-13	10	3.50		D		Dark grey slightly sandy gravelly silty CLAY.			27.0	63	37	23	14		CI
BH-14	11	3.50		D		Dark grey slightly sandy slightly gravelly SILT.			49.0						
BH-14	14	4.50		D		Dark grey slightly silty very sandy medium and fine GRAVEL.			7.6						
BPA-BH01	11	3.50		D		Dark grey sandy very silty medium GRAVEL.			43.0	27	85	58	27		
BPA-BH01	14	4.50		D		Dark grey very silty very sandy medium GRAVEL.			18.0	29	37	28	9		MI
BPA-BH02	5	1.50		D		Dark grey slightly sandy gravelly SILT.			34.0	49	61	37	24		MH
BPA-BH02	8	2.50		D		Dark grey slightly sandy slightly gravelly SILT.			28.0	47	56	41	15		MH
BPA-BH02	11	3.50		D		Dark grey silty very gravelly coarse SAND.			20.0						
BPA-BH02	14	4.50		D		Dark grey silty very gravelly coarse SAND.			11.0						
BPA-BH02	17	5.50		D		Dark brown very gravelly very silty coarse SAND.			14.0						
BPA-BH03A	5	1.50		D		Grey slightly gravelly slightly sandy SILT.			42.0	83	38	35	3		MI
BPA-BH03A	8	2.50		D		Dark grey slightly sandy slightly gravelly SILT.			34.0						
BPA-BH03A	11	3.50		D		Dark grey very sandy very silty medium GRAVEL.			22.0						
BPA-BH03A	14	4.50		D		Grey silty sandy f,m,c GRAVEL.			14.0						
BPA-TP01	1	3.20	3.40	B		Dark grey very sandy very silty medium GRAVEL.			26.0	42					
BPA-TP02	2	1.50	1.70	D		Dark brown gravelly sandy SILT.			35.0	72	39	28	11		MI

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key: w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: wd - water displacement; wi - immersion in water

Linear measurement unless : 4pt cone unless : 1pt - single point test; NP - Non Plastic

Particle density: sp - small pyknometer; gj - gas jar

Date Printed: 23/04/2021

QC From No: R1

Approved By: DCD

Table 1 sheet 1

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

Summary of Classification Test Results

Project No.: 2020MH103

Project Name: Ballivor Wind Farm

Hole No.	Sample Ref	Top	Base	Type		Soil Description	Density bulk Mg/m3	Density dry Mg/m3	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Remarks
BPA-TP02	3	2.50	2.70	B		Dark grey very gravelly very silty coarse SAND.			22.0	50					
TP-02	2	1.60	1.80	D		Dark grey slightly gravelly sandy SILT.			25.0	87					NP
TP-04	3	1.70	1.90	D		Grey slightly sandy gravelly SILT. Gravel is medium.			36.0	42					
TP-08	3	2.20	2.40	D		Light grey slightly gravelly sandy SILT.			16.0	64	19	16	3		ML
TP-12	2	1.80	2.00	D		Dark grey slightly sandy SILT.			46.0	87	53	31	22		MH
TP-13	4	3.00	3.20	D		Grey slightly sandy gravelly SILT.			13.0	51	22	13	9		CL
TP-18	3	3.20	3.40	B		Dark grey very silty very sandy medium GRAVEL.			11.0	33					
TP-20	3	2.40	2.60	D		Dark grey slightly sandy gravelly SILT.			15.0	53	28	18	10		CL
TP-24	4	3.30	3.50	D		Dark grey very sandy very silty GRAVEL.			9.9	41	25	15	10		ML
TP-25	2	1.70	1.90	D		Dark grey slightly gravelly slightly sandy SILT.			18.0	87	25	18	7		CL
TP-25	3	2.80	3.00	B		Dark grey very silty very gravelly SAND.			13.0	48					
TP-26	2	2.20	2.40	D		Grey slightly gravelly sandy SILT. Sand is medium.			14.0	56					NP
TP-29	3	3.40	3.60	D		Dark grey slightly gravelly sandy silty CLAY.			12.0	67	28	15	13		CL
TP-A	3	2.70	2.90	D		Grey slightly gravelly sandy SILT. Sand is medium.			18.0	73					NP
TP-B	2	2.40	2.60	D		Grey-brown gravelly very sandy SILT.			54.0	75	51	46	5		MH
TP-C	4	2.50	2.70	D		Grey very gravelly very silty SAND.			12.0	54	26	17	9		CL
TP-E	2	2.05	2.25	D		Dark brown slightly gravelly slightly sandy SILT.			58.0	80	70	42	28		MV
TP-F	2	2.30	2.50	D		Dark grey slightly gravelly slightly sandy SILT.			26.0	73	30	21	9		CL
TP-G	2	3.80	4.00	B		Dark grey silty sandy coarse GRAVEL.			19.0	18					
TP-H	3	2.30	2.50	B		Grey silty gravelly medium SAND.			26.0	54					
TP-I	2	3.50	3.70	B		Dark grey slightly silty very sandy medium GRAVEL.			14.0	8					
TP-J	2	2.70	2.90	B		Dark gey slightly silty very sandy medium GRAVEL.			16.0	6					
TP-K	3	3.80	4.00	B		Grey slightly silty very sandy medium GRAVEL.			17.0	4					
TP-L	3	2.00	2.20	B		Dark grey slightly gravelly silty fine and medium SAND.			23.0	75					
TP-M	2	3.10	3.30	B		Dark grey silty very sandy coarse GRAVEL.			17.0	19					
TP-N	4	2.50	2.70	D		Grey slightly gravelly slightly sandy silty CLAY.			12.0	57	23	15	8		CL

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key: w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: wd - water displacement; wi - immersion in water

Linear measurement unless : 4pt cone unless : 1pt - single point test; NP - Non Plastic

Liquid Limit

Particle density: sp - small pyknometer; gj - gas jar

Date Printed: 23/04/2021

QC From No: R1

Approved By: DCD

Table 1 sheet 2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

Summary of Classification Test Results

Project No.: 2020MH103

Project Name: Ballivor Wind Farm

Hole No.	Sample Ref	Top	Base	Type		Soil Description	Density bulk Mg/m3	Density dry Mg/m3	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Remarks
TP-O	3	3.00	3.20	D		Dark brown gravelly very sandy SILT.			43.0	83					NP
TP-P	1	1.50	1.70	B		Black Peat.			907.0						
TP-Q	1	1.00	1.20	B		Black Peat.			797.0						
TP-Q	3	2.20	2.40	D		Grey slightly sandy gravely silty CLAY..			18.0	79	25	18	7		CL
TP-R	2	4.40	4.60	D		Grey silty CLAY.			23.0	99	33	23	10		CL
TP-S	2	1.00	1.20	D		Brownish-grey slightly gravelly slightly sandy SILT.			34.0	77	39	30	9		MI
TP-S	4	3.60	3.80	B		Light grey silty very sandy medium GRAVEL.			15.0	29					
TP-T	4	2.80	3.00	D		Grey very gravelly very sandy SILT.			12.0	60	25	16	9		CL
TP-V	1	3.00	3.20	B		Dark grey silty very sasndy medium GRAVEL.			7.9	11					
TP-W	2	4.00	4.20	B		Grey slightly silty sandy medium GRAVEL.			18.0	6					
TP-X	2	4.10	4.30	D		Dark grey slightly gravelly sandy SILT. Sand is fine.			36.0	82					NP
TP-Y	1	3.80	4.00	B		Black Peat.			644.0						
TP-Z	1	1.00	1.20	B		Black Peat.			756.0						
TP-Z	4	2.90	3.10	B		Grey slightly sandy gravelly silty CLAY.			12.0	56	22	14	8		CL

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key: w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: wd - water displacement; wi - immersion in water

Linear measurement unless : 4pt cone unless : Liquid Limit; 1pt - single point test; NP - Non Plastic

Particle density: sp - small pyknometer; gj - gas jar

Date Printed: 23/04/2021

QC From No: R1

Approved By: DCD

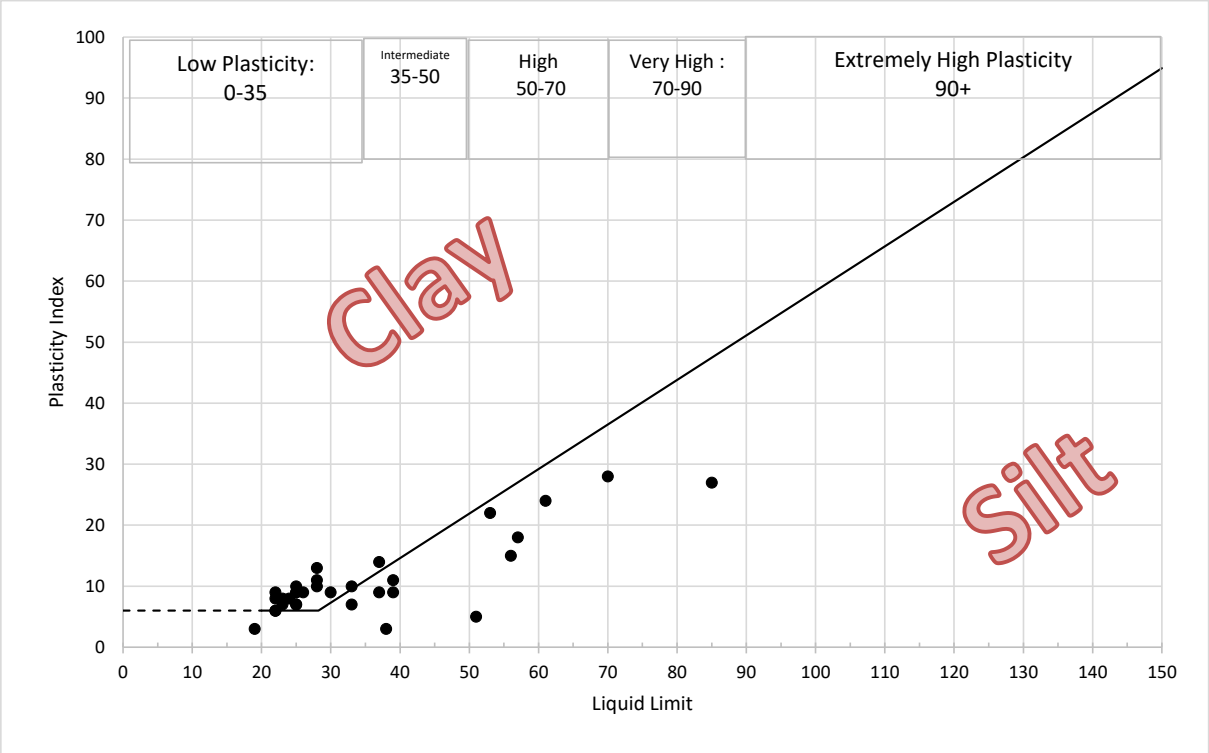
Table 1

sheet 3

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

	Plasticity (A-Line) Chart	Project Number
Project Name:	**Ballivor Wind Farm**	
Location:		2020MH103



Abreviations in the remarks column of the Classification Summary Sheet: C = Clay, M = Silt

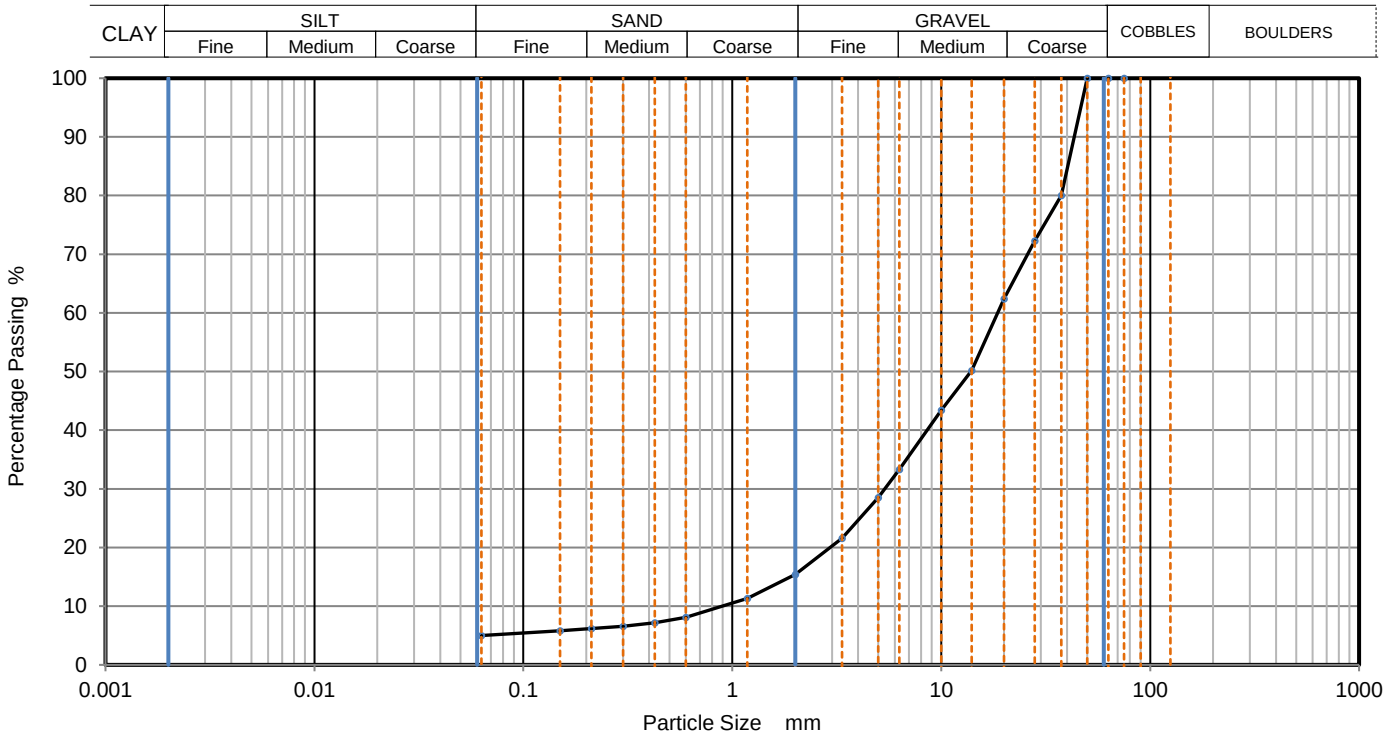
Plasticity abeviations: L = Low, I = Intermediate = H = High, V = Very High, E = Extremely High.

The letter O is added to the symbol of any material containing a significant proportion of organic material.

Chart taken from BS5930: 2010

QC Form: R1

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-02
Site Name	Ballivor Wind Farm			Sample No.	13
Soil Description	Grey slightly silty sandy medium and coarse GRAVEL.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021030312



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	80		
28	72		
20	62		
14	50		
10	43		
6.3	33		
5	29		
3.35	22		
2	15		
1.18	11		
0.6	8		
0.425	7		
0.3	7		
0.212	6		
0.15	6		
0.063	5		

Dry Mass of sample, g	1288

Sample Proportions	% dry mass
Very coarse	0
Gravel	85
Sand	11
Fines <0.063mm	5

Grading Analysis		
D100	mm	
D60	mm	18.6
D30	mm	5.38
D10	mm	0.895
Uniformity Coefficient		21
Curvature Coefficient		1.7

Remarks

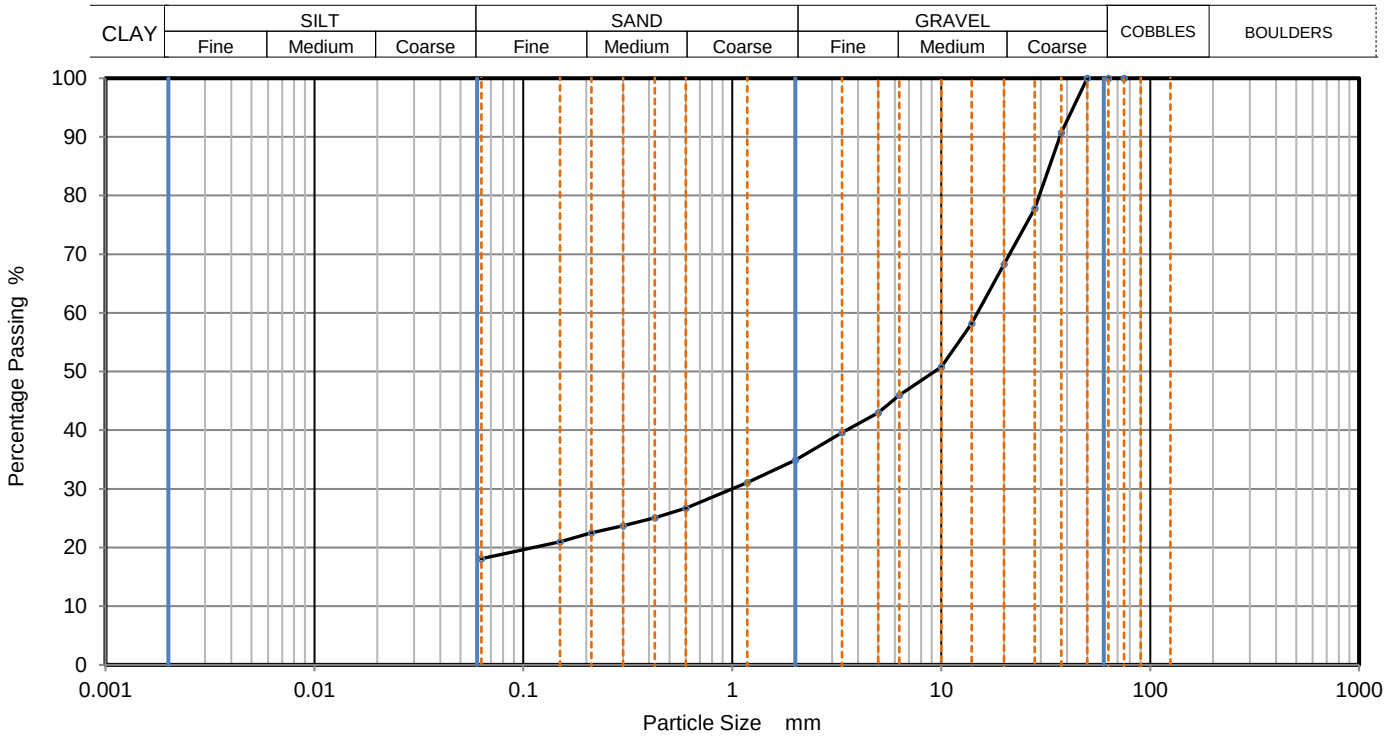
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	23/04/2021 09:43	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-02
Site Name	Ballivor Wind Farm			Sample No.	16
Soil Description	Grey sandy silty coarse GRAVEL.			Depth, m	5.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021030315



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	91		
28	78		
20	68		
14	58		
10	51		
6.3	46		
5	43		
3.35	40		
2	35		
1.18	31		
0.6	27		
0.425	25		
0.3	24		
0.212	23		
0.15	21		
0.063	18		

Dry Mass of sample, g	926

Sample Proportions	% dry mass
Very coarse	0
Gravel	65
Sand	17
Fines <0.063mm	18

Grading Analysis		
D100	mm	
D60	mm	14.9
D30	mm	1
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

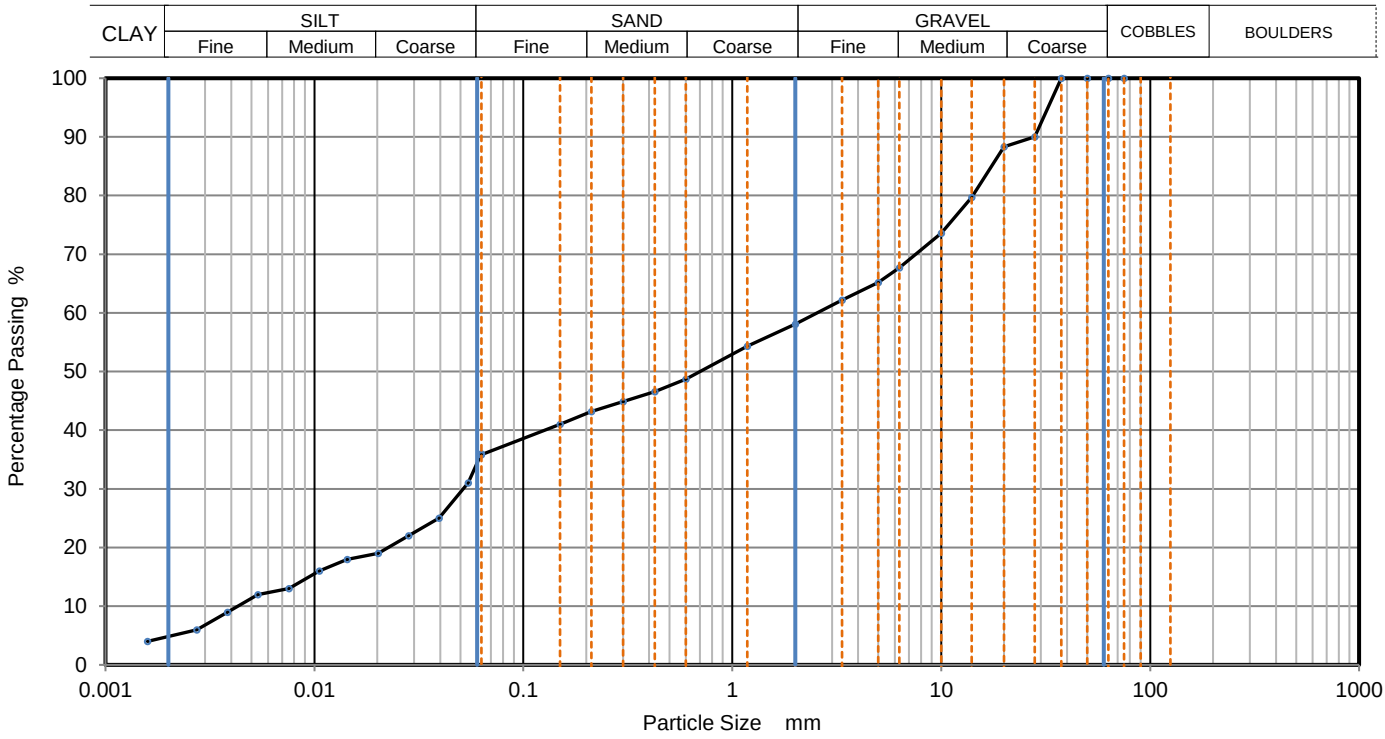
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	23/04/2021 09:43	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-04
Site Name	Ballivor Wind Farm			Sample No.	12
Soil Description	Dark grey slightly sandy gravelly SILT. Gravel is medium.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL12021030334



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	36
		0.0544	31
75	100	0.0394	25
63	100	0.0282	22
50	100	0.0202	19
37.5	100	0.0144	18
28	90	0.0105	16
20	88	0.0075	13
14	80	0.0054	12
10	74	0.0038	9
6.3	68	0.0027	6
5	65	0.0016	4
3.35	62		
2	58		
1.18	54		
0.6	49	Particle density (assumed)	
0.425	47	2.65 Mg/m3	
0.3	45		
0.212	43		
0.15	41		
0.063	36		

Dry Mass of sample, g	511

Sample Proportions	% dry mass
Very coarse	0
Gravel	42
Sand	22
Silt	31
Clay	5

Grading Analysis		
D100	mm	
D60	mm	2.55
D30	mm	0.0507
D10	mm	0.00431
Uniformity Coefficient		590
Curvature Coefficient		0.23

Remarks

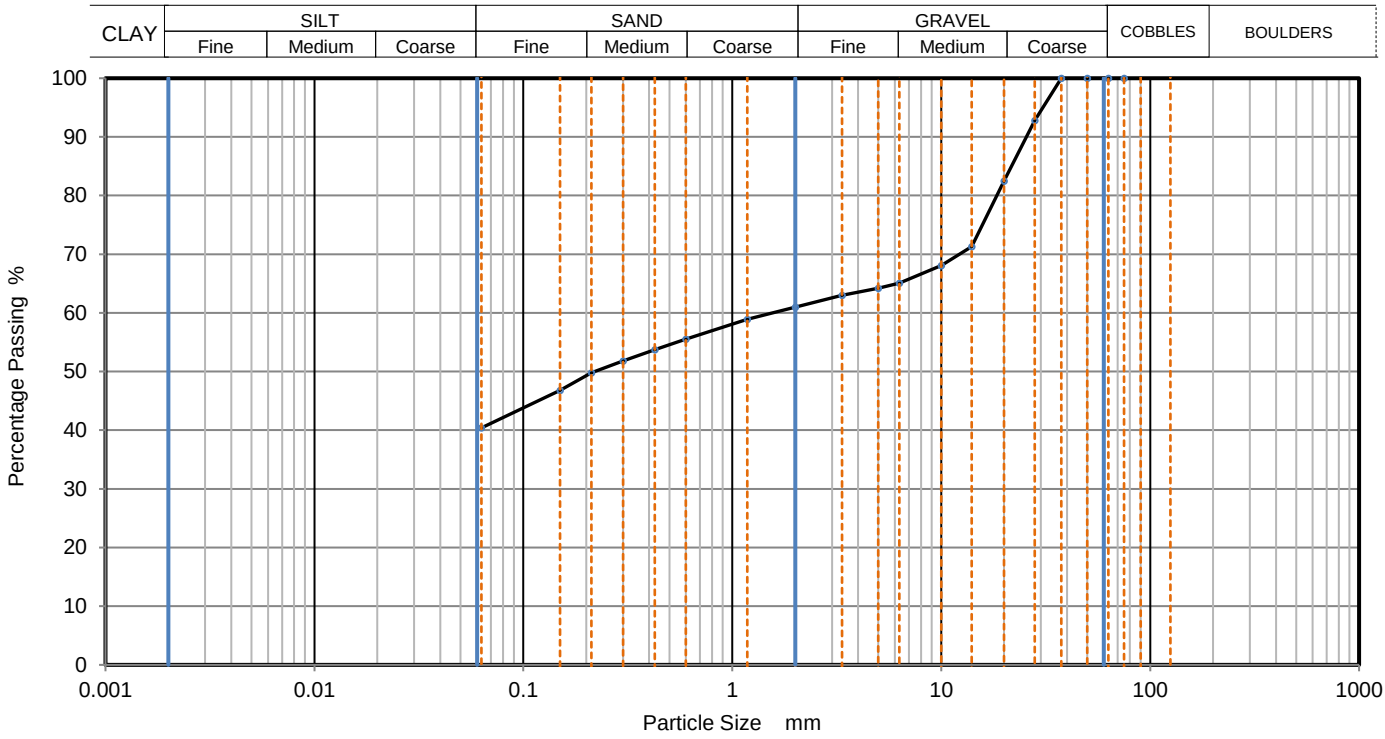
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	23/04/2021 09:43	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-04
Site Name	Ballivor Wind Farm			Sample No.	15
Soil Description	Dark grey slightly sandy gravelly SILT.			Depth, m	5.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021030337



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	93		
20	83		
14	71		
10	68		
6.3	65		
5	64		
3.35	63		
2	61		
1.18	59		
0.6	56		
0.425	54		
0.3	52		
0.212	50		
0.15	47		
0.063	40		

Dry Mass of sample, g	582

Sample Proportions	% dry mass
Very coarse	0
Gravel	39
Sand	21
Fines <0.063mm	40

Grading Analysis		
D100	mm	
D60	mm	1.55
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

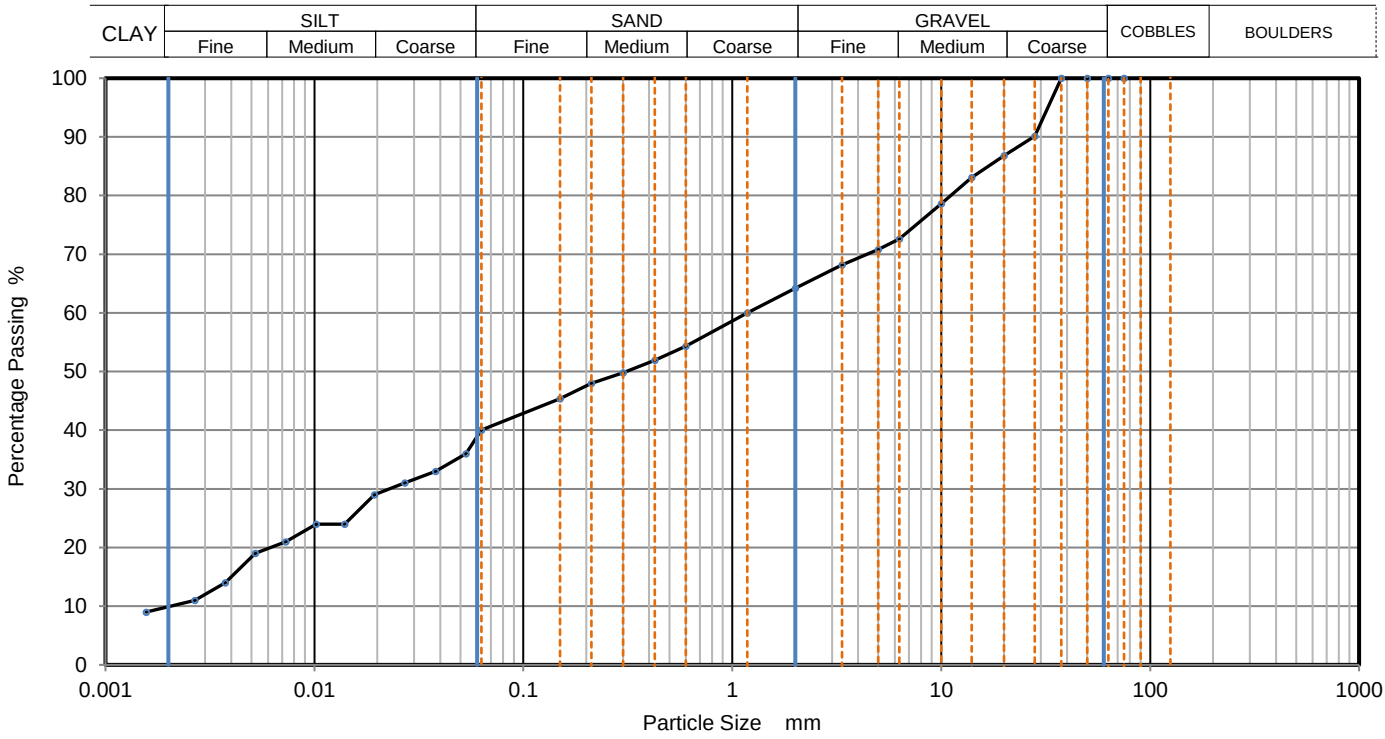
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	23/04/2021 09:43	**1**
				QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-05
Site Name	Ballivor Wind Farm			Sample No.	12
Soil Description	Grey slightly sandy gravelly SILT.			Depth, m	3.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL12021030354



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	40
		0.0530	36
75	100	0.0380	33
63	100	0.0270	31
50	100	0.0194	29
37.5	100	0.0139	24
28	90	0.0102	24
20	87	0.0073	21
14	83	0.0052	19
10	79	0.0037	14
6.3	73	0.0027	11
5	71	0.0016	9
3.35	68		
2	64		
1.18	60		
0.6	54	Particle density (assumed)	
0.425	52	2.65	Mg/m3
0.3	50		
0.212	48		
0.15	45		
0.063	40		

Dry Mass of sample, g	742

Sample Proportions	% dry mass
Very coarse	0
Gravel	36
Sand	24
Silt	30
Clay	10

Grading Analysis		
D100	mm	
D60	mm	1.19
D30	mm	0.0229
D10	mm	0.00205
Uniformity Coefficient		580
Curvature Coefficient		0.22

Remarks

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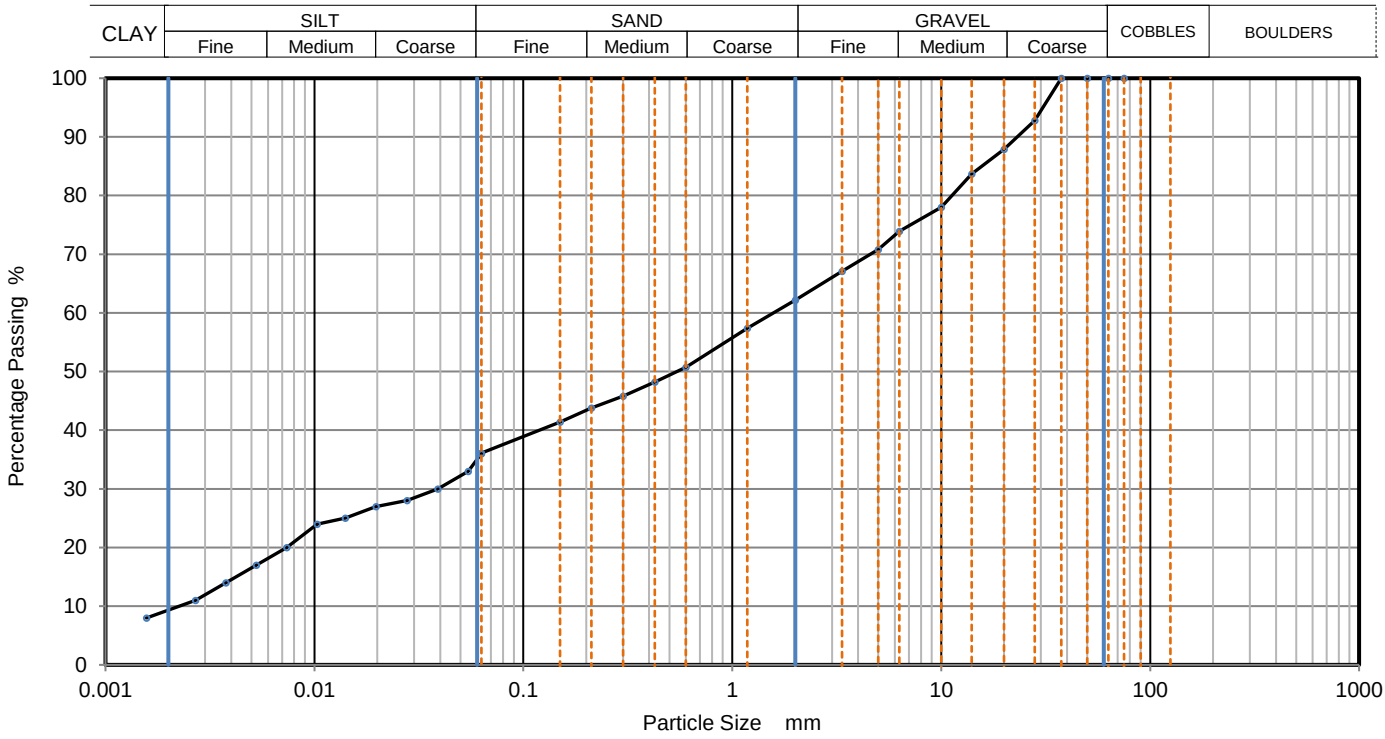
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-07
Site Name	Ballivor Wind Farm			Sample No.	10
Soil Description	Grey slightly sandy gravelly silty CLAY.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL12021030395



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	36
		0.0544	33
75	100	0.0390	30
63	100	0.0277	28
50	100	0.0197	27
37.5	100	0.0140	25
28	93	0.0103	24
20	88	0.0074	20
14	84	0.0053	17
10	78	0.0038	14
6.3	74	0.0027	11
5	71	0.0016	8
3.35	67		
2	62		
1.18	57		
0.6	51	Particle density (assumed)	
0.425	48	2.65 Mg/m3	
0.3	46		
0.212	44		
0.15	41		
0.063	36		

Dry Mass of sample, g	547

Sample Proportions	% dry mass
Very coarse	0
Gravel	38
Sand	26
Silt	27
Clay	9

Grading Analysis		
D100	mm	
D60	mm	1.57
D30	mm	0.0397
D10	mm	0.00227
Uniformity Coefficient		690
Curvature Coefficient		0.44

Remarks

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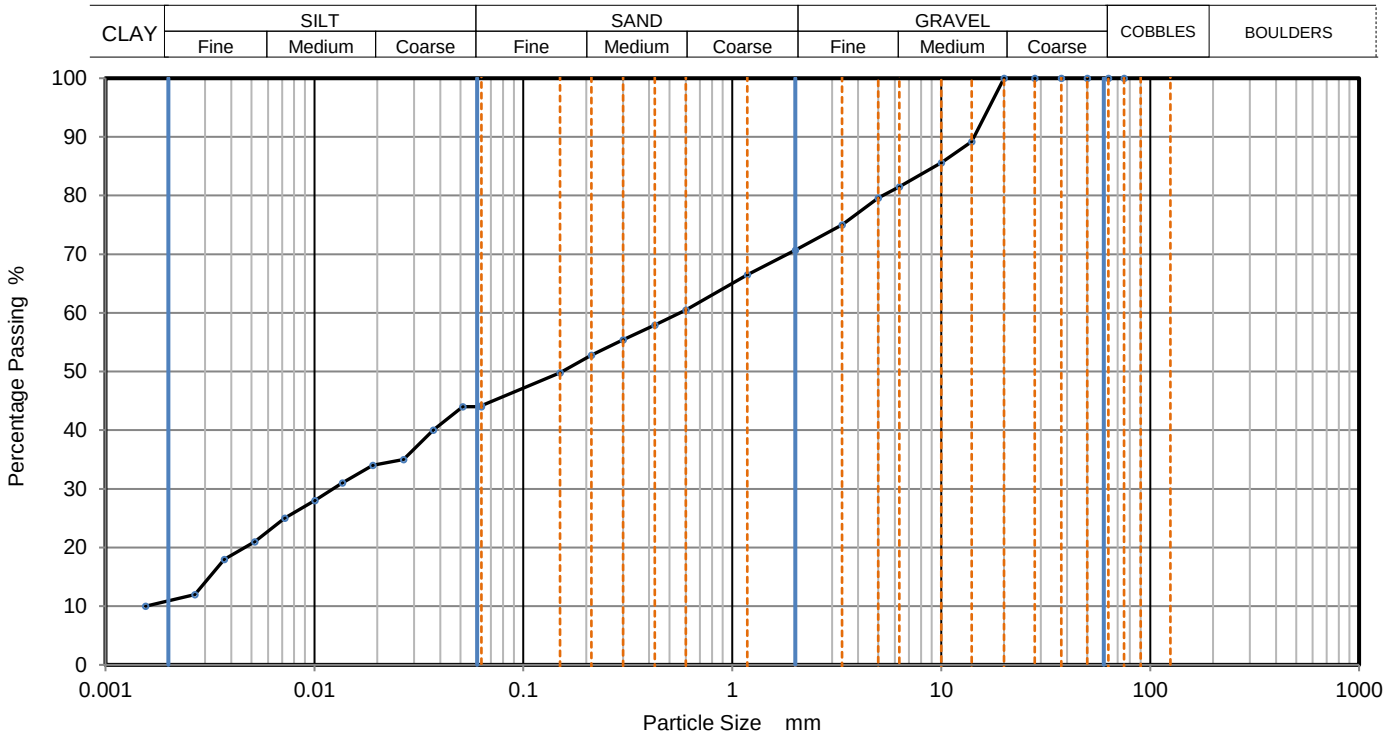
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-07
Site Name	Ballivor Wind Farm			Sample No.	16
Soil Description	Dark grey slightly sandy slightly gravelly SILT.			Depth, m	5.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL120210303101



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	44
		0.0512	44
75	100	0.0370	40
63	100	0.0267	35
50	100	0.0190	34
37.5	100	0.0136	31
28	100	0.0101	28
20	100	0.0072	25
14	89	0.0052	21
10	86	0.0037	18
6.3	82	0.0027	12
5	80	0.0016	10
3.35	75		
2	71		
1.18	67		
0.6	61	Particle density (assumed)	
0.425	58	2.65	Mg/m3
0.3	55		
0.212	53		
0.15	50		
0.063	44		

Dry Mass of sample, g	739

Sample Proportions	% dry mass
Very coarse	0
Gravel	29
Sand	27
Silt	33
Clay	11

Grading Analysis		
D100	mm	
D60	mm	0.564
D30	mm	0.0124
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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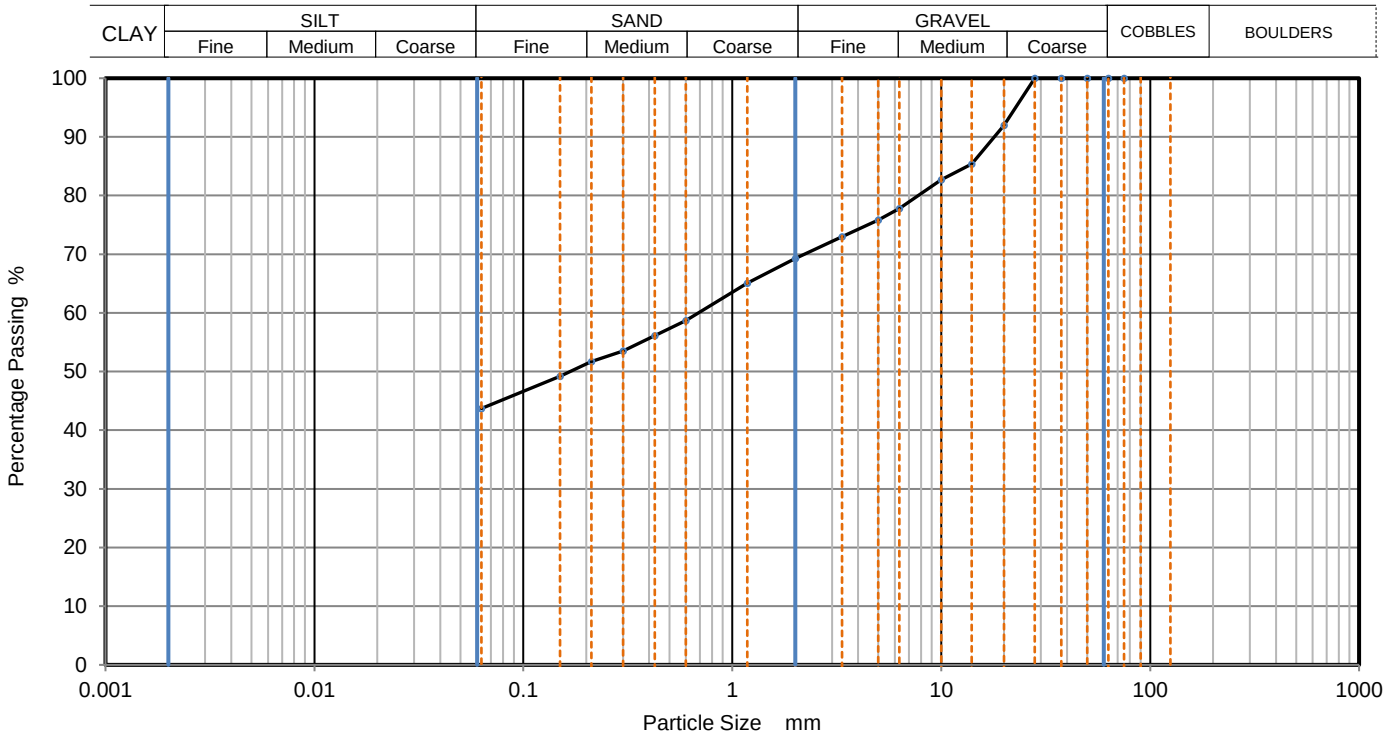
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-08
Site Name	Ballivor Wind Farm			Sample No.	12
Soil Description	Dark grey slightly sandy slightly gravelly SILT.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303115



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	92		
14	85		
10	83		
6.3	78		
5	76		
3.35	73		
2	69		
1.18	65		
0.6	59		
0.425	56		
0.3	54		
0.212	52		
0.15	49		
0.063	44		

Dry Mass of sample, g	565

Sample Proportions	% dry mass
Very coarse	0
Gravel	31
Sand	26
Fines <0.063mm	44

Grading Analysis		
D100	mm	
D60	mm	0.686
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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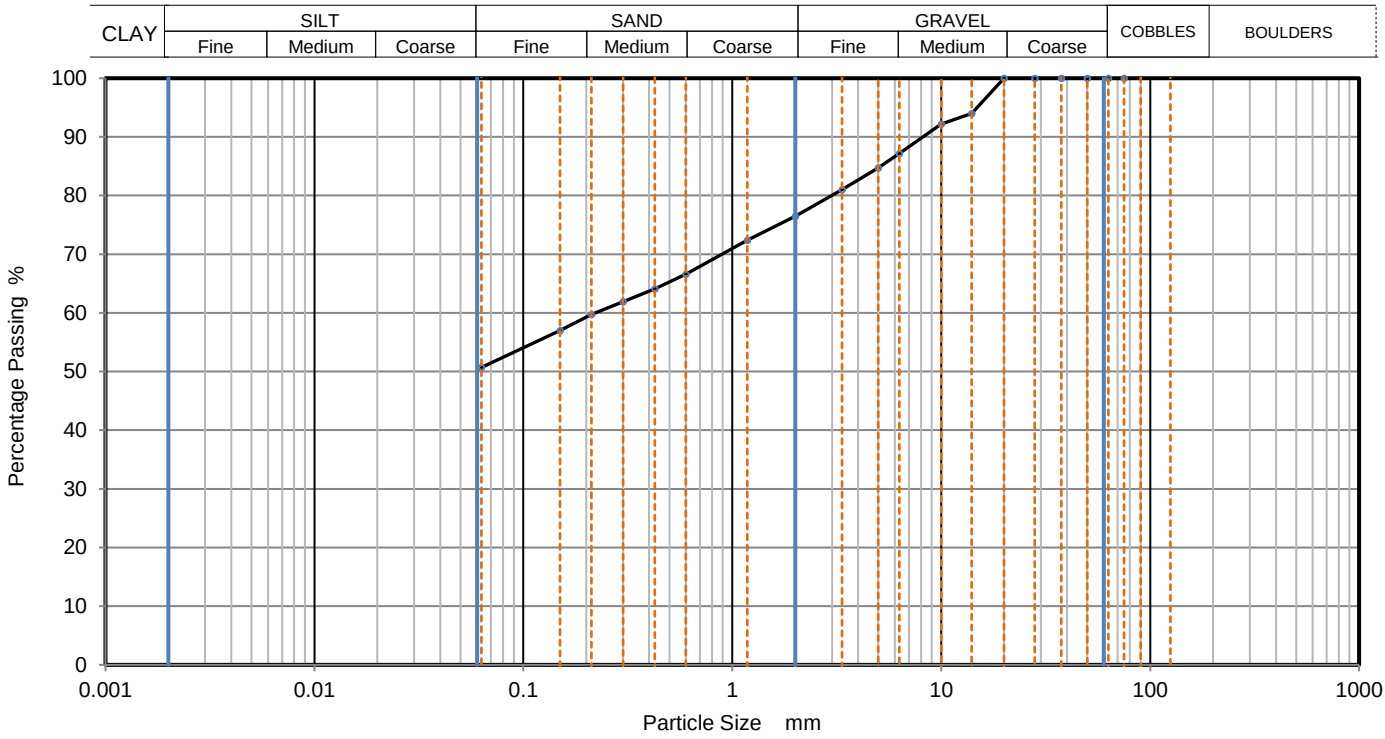
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-09
Site Name	Ballivor Wind Farm			Sample No.	13
Soil Description	Grey slightly gravelly slightly sandy silty CLAY.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303133



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	94		
10	92		
6.3	87		
5	85		
3.35	81		
2	77		
1.18	72		
0.6	67		
0.425	64		
0.3	62		
0.212	60		
0.15	57		
0.063	51		

Dry Mass of sample, g	594

Sample Proportions	% dry mass
Very coarse	0
Gravel	24
Sand	26
Fines <0.063mm	51

Grading Analysis		
D100	mm	
D60	mm	0.221
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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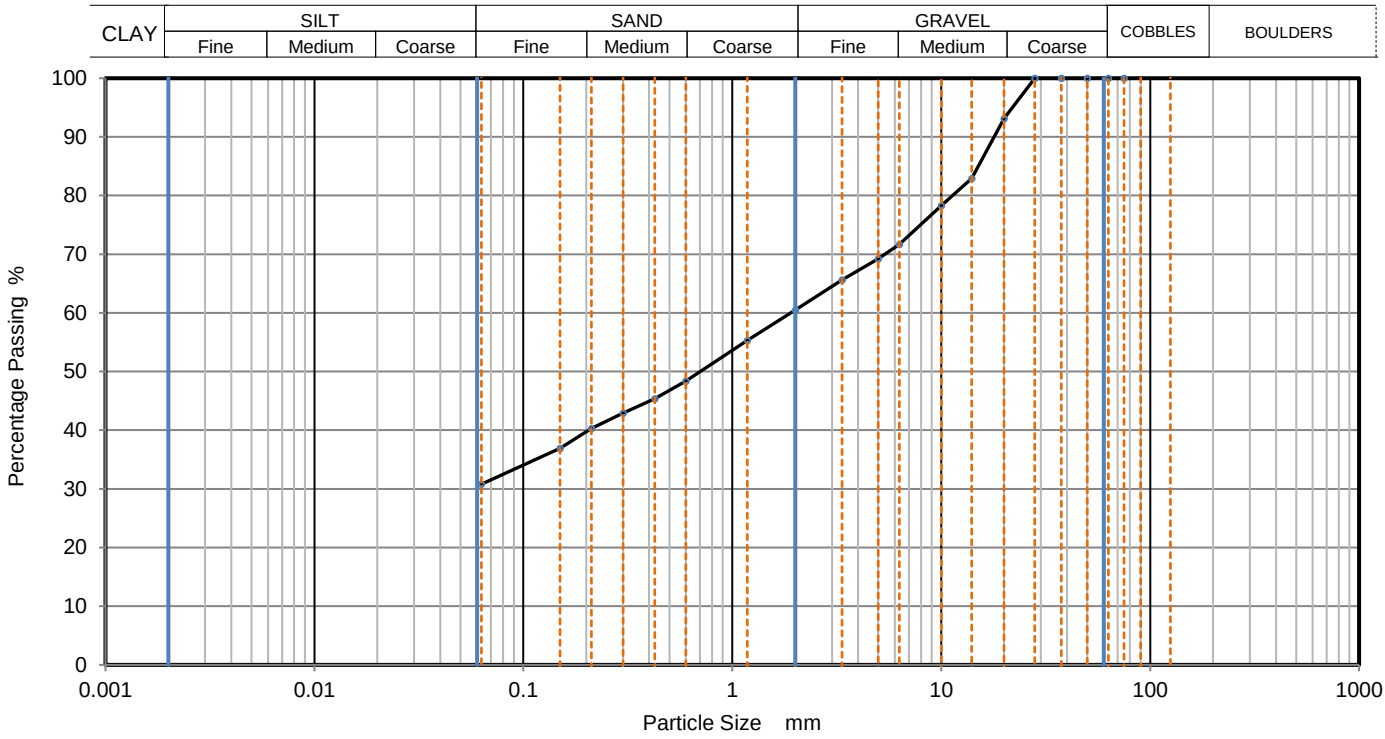
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-10
Site Name	Ballivor Wind Farm			Sample No.	13
Soil Description	Grey very sandy very silty medium GRAVEL.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303147



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	93		
14	83		
10	78		
6.3	72		
5	69		
3.35	66		
2	61		
1.18	55		
0.6	48		
0.425	45		
0.3	43		
0.212	40		
0.15	37		
0.063	31		

Dry Mass of sample, g	686

Sample Proportions	% dry mass
Very coarse	0
Gravel	40
Sand	30
Fines <0.063mm	31

Grading Analysis		
D100	mm	
D60	mm	1.9
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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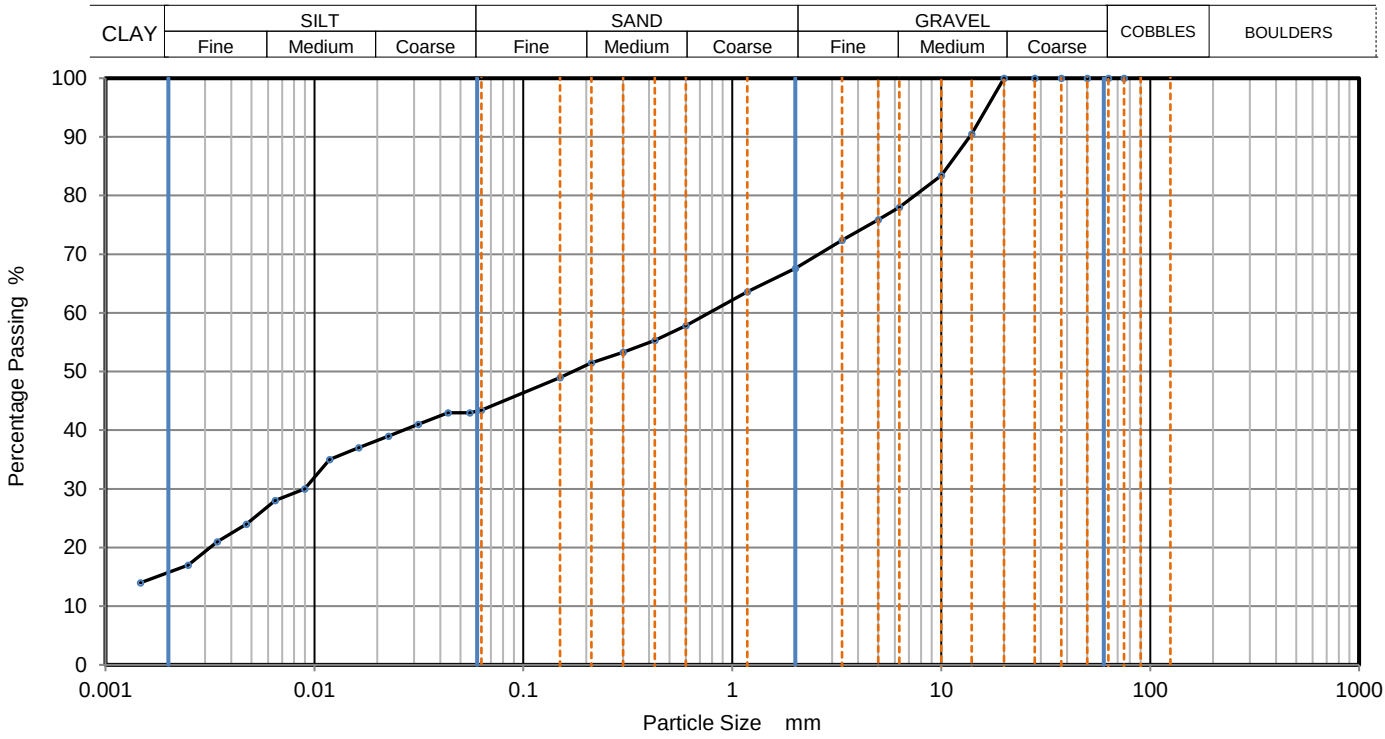
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-11
Site Name	Ballivor Wind Farm			Sample No.	7
Soil Description	Grey very sandy very gravelly SILT. Gravel is medium.			Depth, m	2.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL120210303156



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0553	43
		0.0436	43
75	100	0.0314	41
63	100	0.0226	39
50	100	0.0163	37
37.5	100	0.0118	35
28	100	0.0090	30
20	100	0.0065	28
14	91	0.0047	24
10	83	0.0034	21
6.3	78	0.0025	17
5	76	0.0015	14
3.35	72		
2	68		
1.18	64		
0.6	58	Particle density (assumed)	
0.425	55	2.65	Mg/m3
0.3	53		
0.212	52		
0.15	49		
0.063	43		

Dry Mass of sample, g	576

Sample Proportions	% dry mass
Very coarse	0
Gravel	32
Sand	24
Silt	28
Clay	16

Grading Analysis		
D100	mm	
D60	mm	0.778
D30	mm	0.00856
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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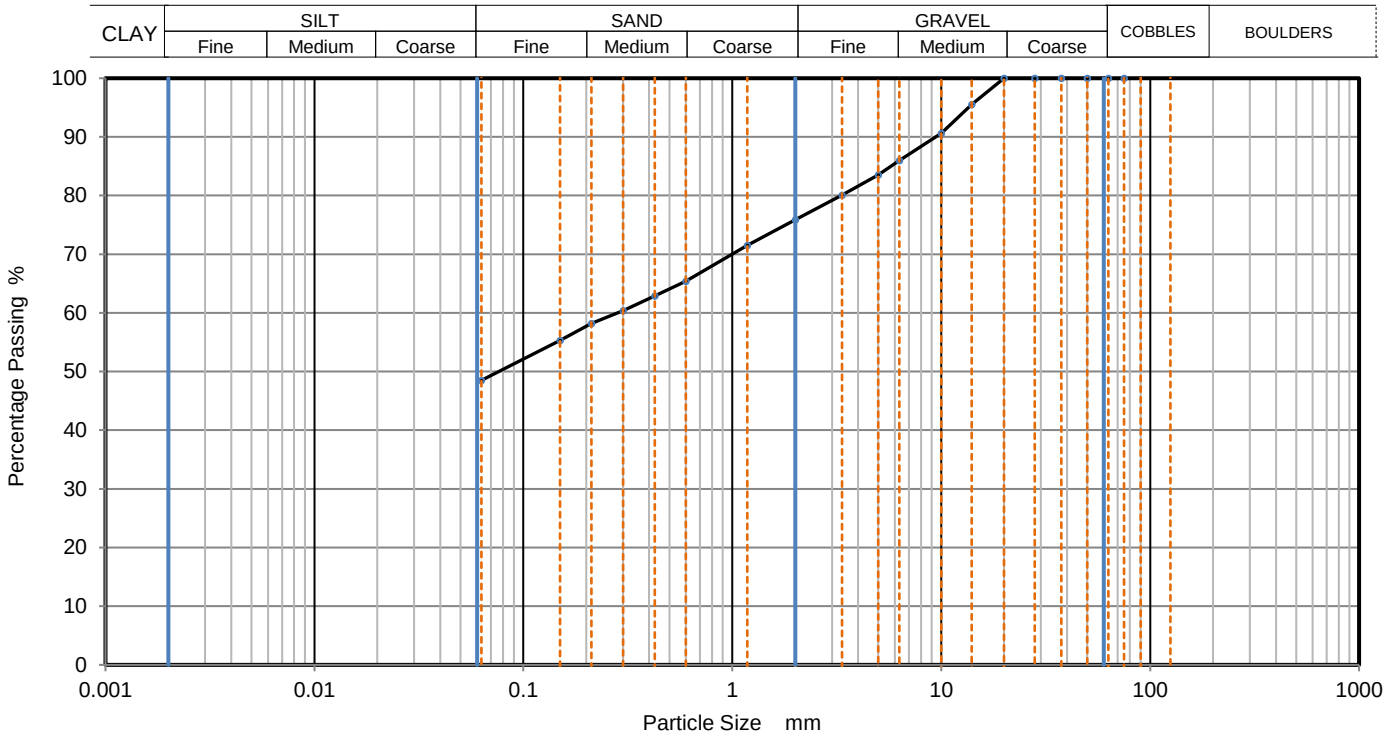
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-13
Site Name	Ballivor Wind Farm			Sample No.	9
Soil Description	Dark grey slightly gravelly slightly sandy SILT.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303189



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	96		
10	91		
6.3	86		
5	84		
3.35	80		
2	76		
1.18	72		
0.6	65		
0.425	63		
0.3	60		
0.212	58		
0.15	55		
0.063	49		

Dry Mass of sample, g	459

Sample Proportions	% dry mass
Very coarse	0
Gravel	24
Sand	27
Fines <0.063mm	49

Grading Analysis		
D100	mm	
D60	mm	0.282
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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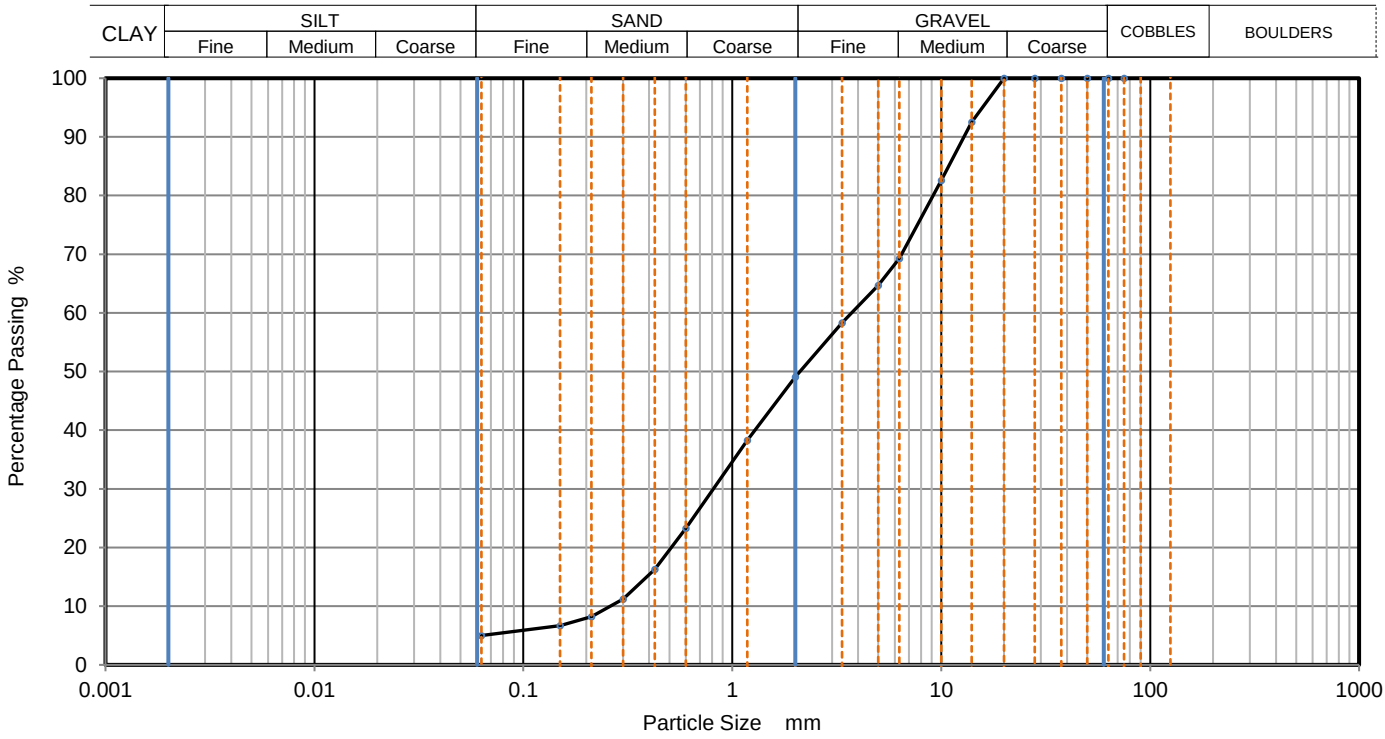
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-13
Site Name	Ballivor Wind Farm			Sample No.	12
Soil Description	Dark grey silty very sandy medium and fine GRAVEL.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303192



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	93		
10	83		
6.3	69		
5	65		
3.35	58		
2	49		
1.18	38		
0.6	23		
0.425	16		
0.3	11		
0.212	8		
0.15	7		
0.063	5		

Dry Mass of sample, g	742

Sample Proportions	% dry mass
Very coarse	0
Gravel	51
Sand	44
Fines <0.063mm	5

Grading Analysis		
D100	mm	
D60	mm	3.73
D30	mm	0.811
D10	mm	0.262
Uniformity Coefficient		14
Curvature Coefficient		0.67

Remarks

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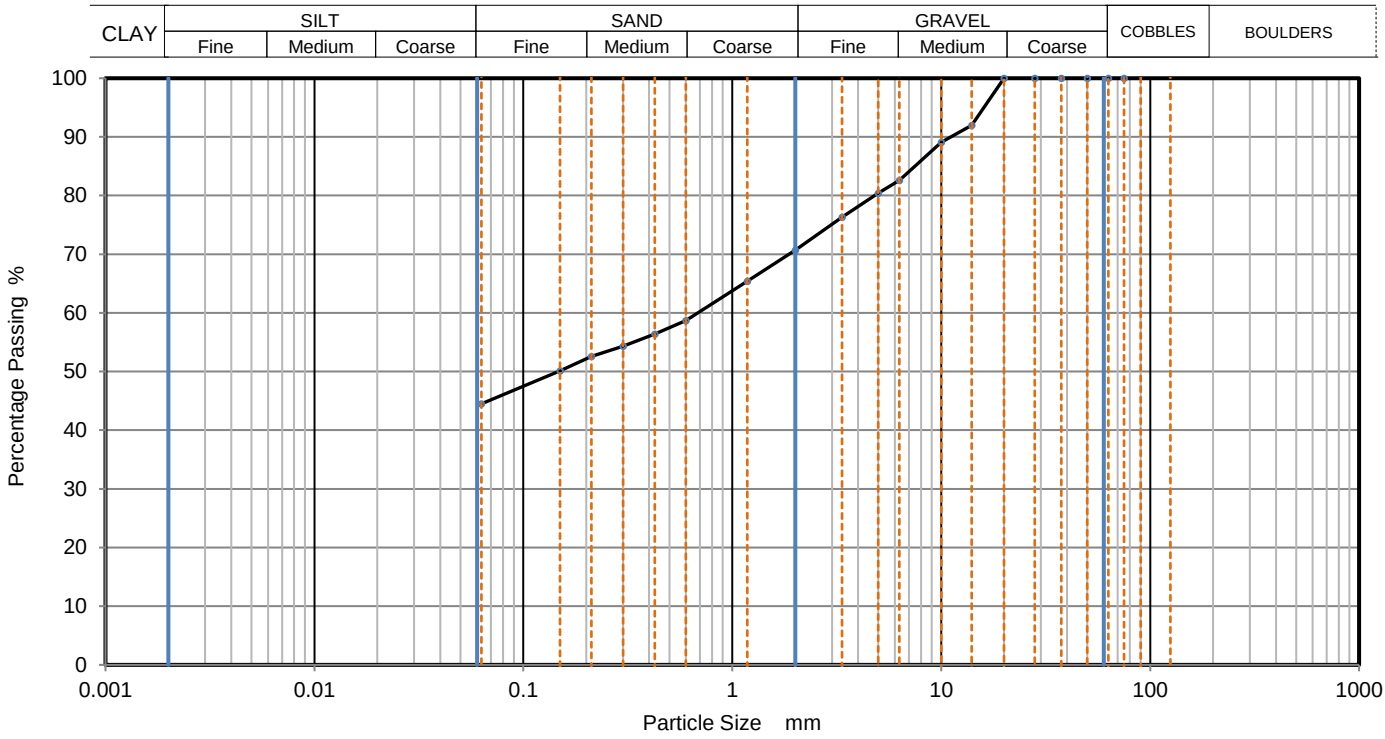
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-14
Site Name	Ballivor Wind Farm			Sample No.	10
Soil Description	Dark grey slightly sandy slightly gravelly SILT.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303203



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	92		
10	89		
6.3	83		
5	80		
3.35	76		
2	71		
1.18	65		
0.6	59		
0.425	56		
0.3	54		
0.212	53		
0.15	50		
0.063	45		

Dry Mass of sample, g	310

Sample Proportions	% dry mass
Very coarse	0
Gravel	29
Sand	26
Fines <0.063mm	44

Grading Analysis		
D100	mm	
D60	mm	0.683
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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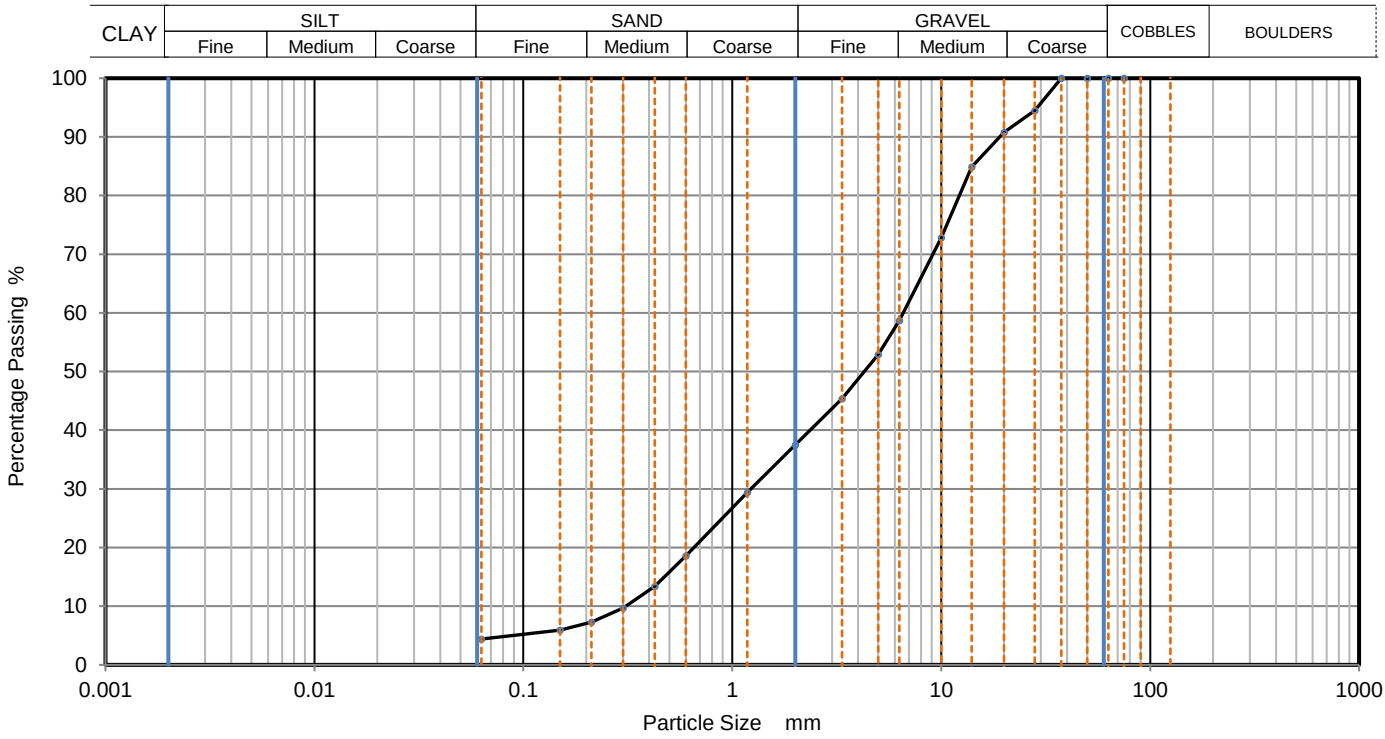
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BH-14
Site Name	Ballivor Wind Farm			Sample No.	13
Soil Description	Dark grey slightly silty very sandy medium and fine GRAVEL.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303206



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	91		
14	85		
10	73		
6.3	59		
5	53		
3.35	45		
2	38		
1.18	29		
0.6	19		
0.425	13		
0.3	10		
0.212	7		
0.15	6		
0.063	4		

Dry Mass of sample, g	762

Sample Proportions	% dry mass
Very coarse	0
Gravel	63
Sand	33
Fines <0.063mm	4

Grading Analysis		
D100	mm	
D60	mm	6.58
D30	mm	1.23
D10	mm	0.309
Uniformity Coefficient		21
Curvature Coefficient		0.75

Remarks

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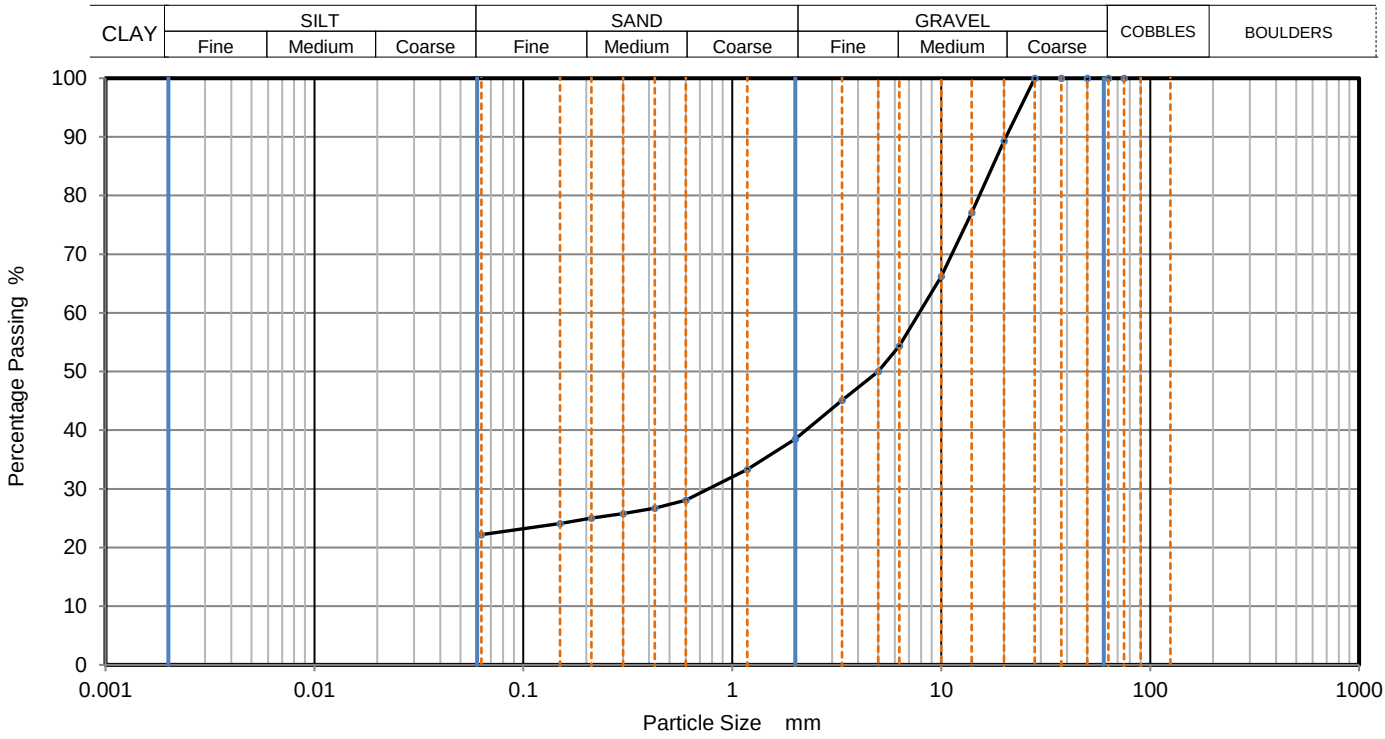
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH01
Site Name	Ballivor Wind Farm			Sample No.	10
Soil Description	Dark grey sandy very silty medium GRAVEL.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303218



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	89		
14	77		
10	66		
6.3	54		
5	50		
3.35	45		
2	39		
1.18	33		
0.6	28		
0.425	27		
0.3	26		
0.212	25		
0.15	24		
0.063	22		

Dry Mass of sample, g	388

Sample Proportions	% dry mass
Very coarse	0
Gravel	62
Sand	16
Fines <0.063mm	22

Grading Analysis		
D100	mm	
D60	mm	7.84
D30	mm	0.77
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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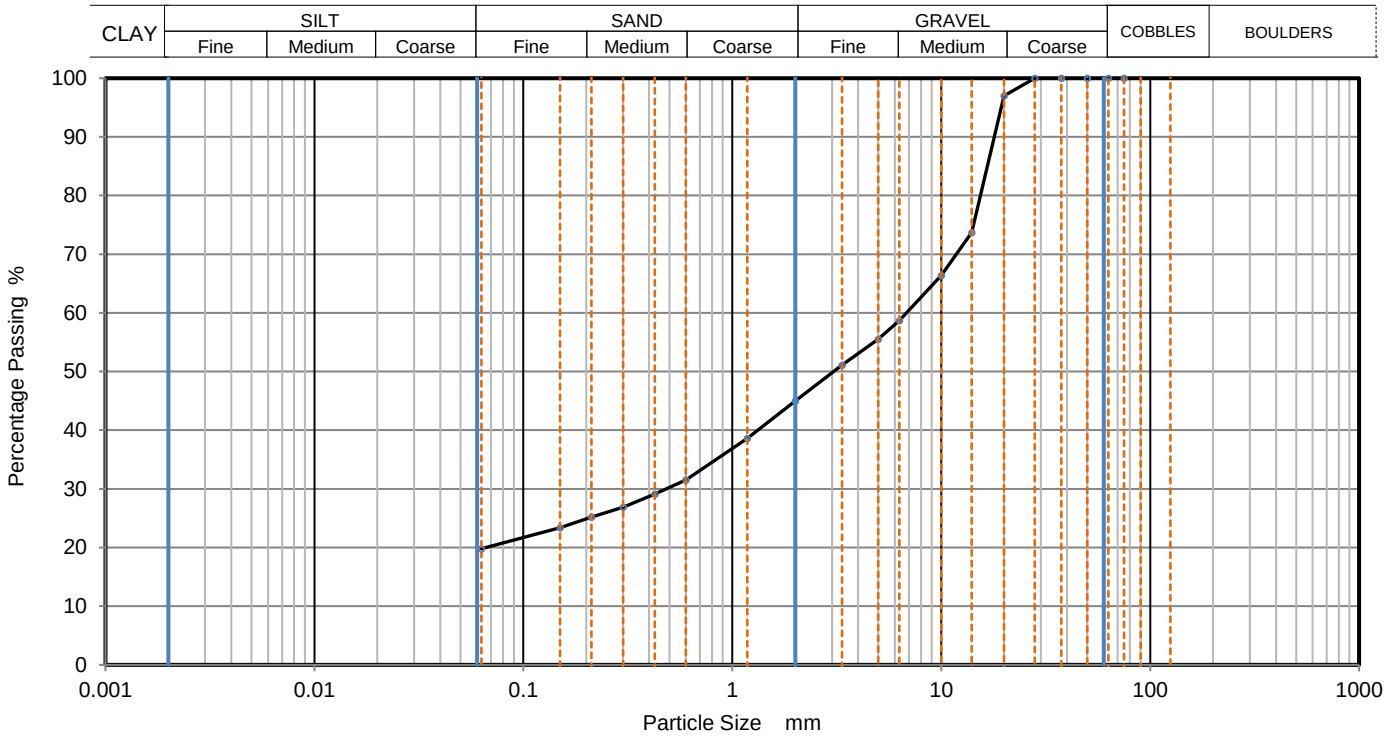
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH01
Site Name	Ballivor Wind Farm			Sample No.	13
Soil Description	Dark grey very silty very sandy medium GRAVEL.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303221



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	97		
14	74		
10	66		
6.3	59		
5	56		
3.35	51		
2	45		
1.18	39		
0.6	32		
0.425	29		
0.3	27		
0.212	25		
0.15	23		
0.063	20		

Dry Mass of sample, g	594

Sample Proportions	% dry mass
Very coarse	0
Gravel	55
Sand	25
Fines <0.063mm	20

Grading Analysis		
D100	mm	
D60	mm	6.83
D30	mm	0.483
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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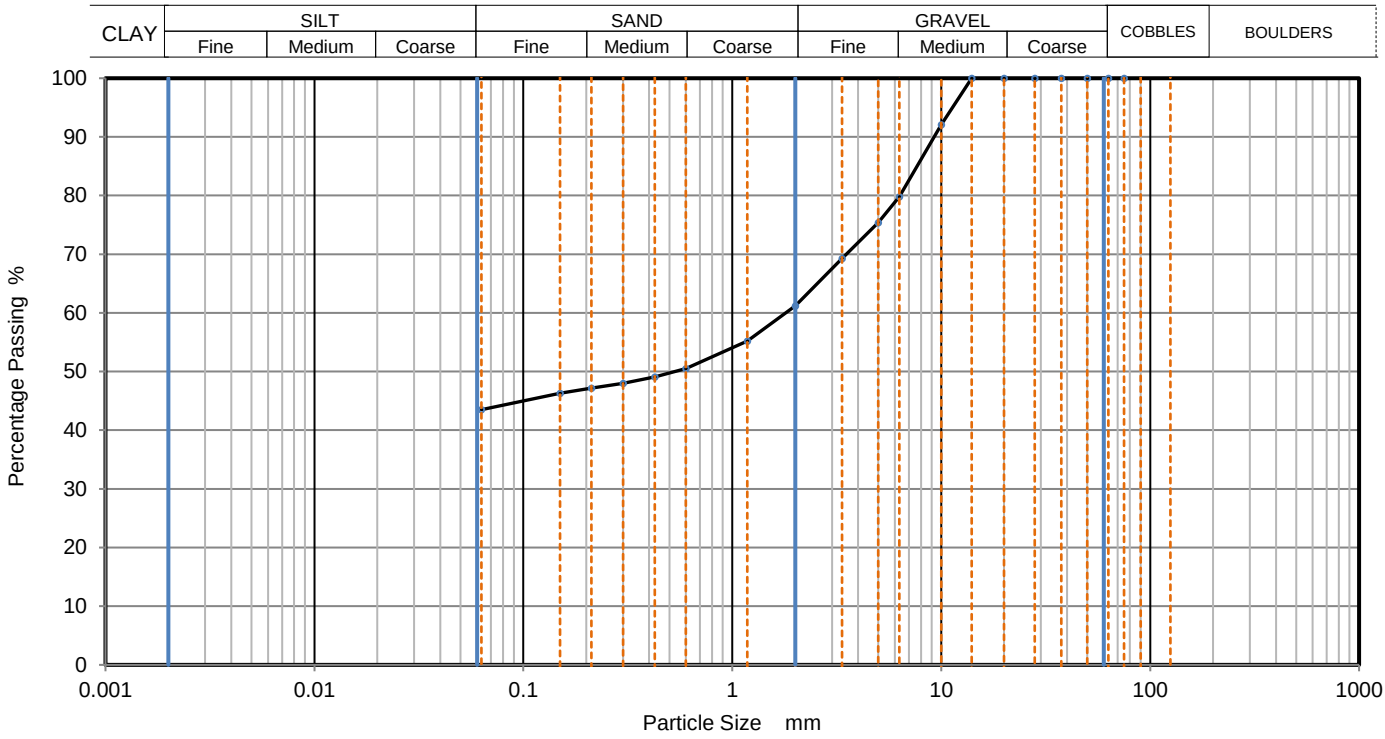
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH02
Site Name	Ballivor Wind Farm			Sample No.	4
Soil Description	Dark grey slightly sandy gravelly SILT.			Depth, m	1.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303227



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	92		
6.3	80		
5	75		
3.35	69		
2	61		
1.18	55		
0.6	51		
0.425	49		
0.3	48		
0.212	47		
0.15	46		
0.063	44		

Dry Mass of sample, g	365

Sample Proportions	% dry mass
Very coarse	0
Gravel	39
Sand	18
Fines <0.063mm	44

Grading Analysis		
D100	mm	
D60	mm	1.79
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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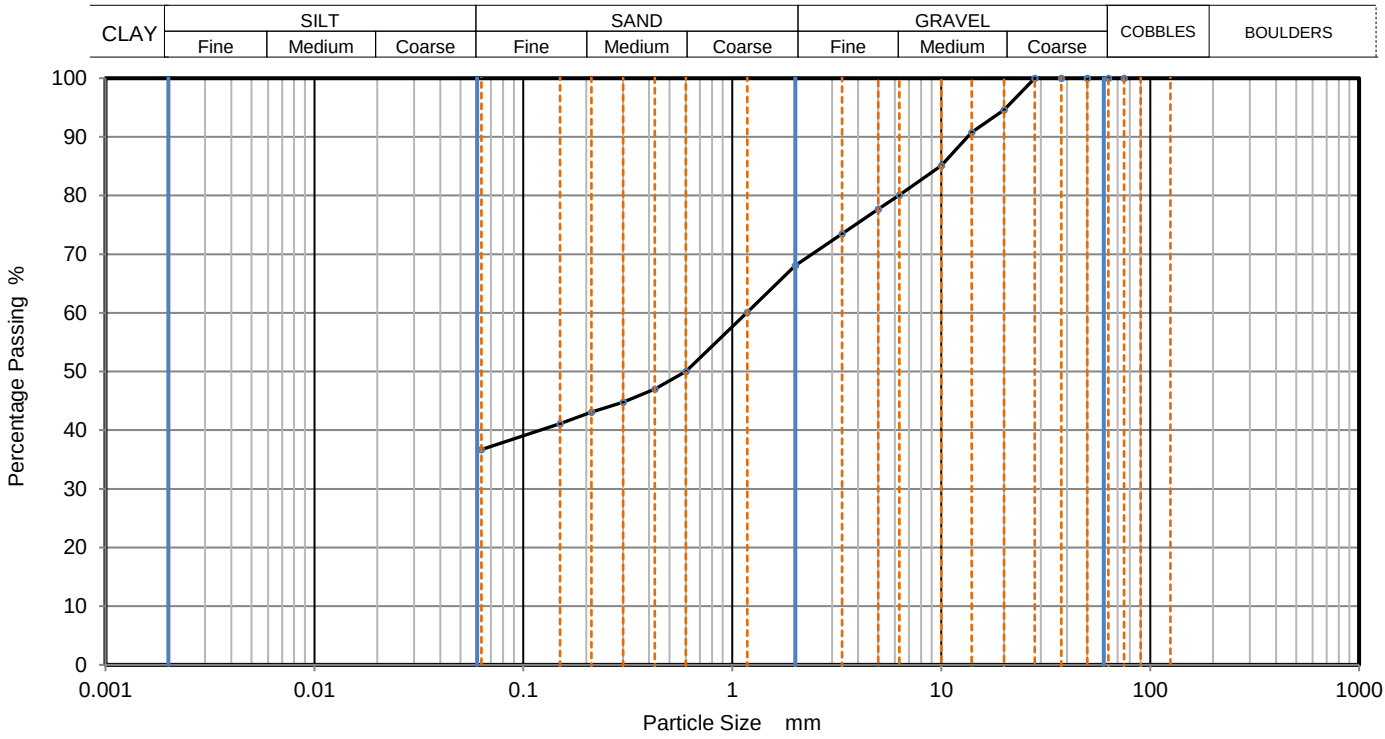
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH02
Site Name	Ballivor Wind Farm			Sample No.	7
Soil Description	Dark grey slightly sandy slightly gravelly SILT.			Depth, m	2.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303230



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	95		
14	91		
10	85		
6.3	80		
5	78		
3.35	74		
2	68		
1.18	60		
0.6	50		
0.425	47		
0.3	45		
0.212	43		
0.15	41		
0.063	37		

Dry Mass of sample, g	473

Sample Proportions	% dry mass
Very coarse	0
Gravel	32
Sand	31
Fines <0.063mm	37

Grading Analysis		
D100	mm	
D60	mm	1.17
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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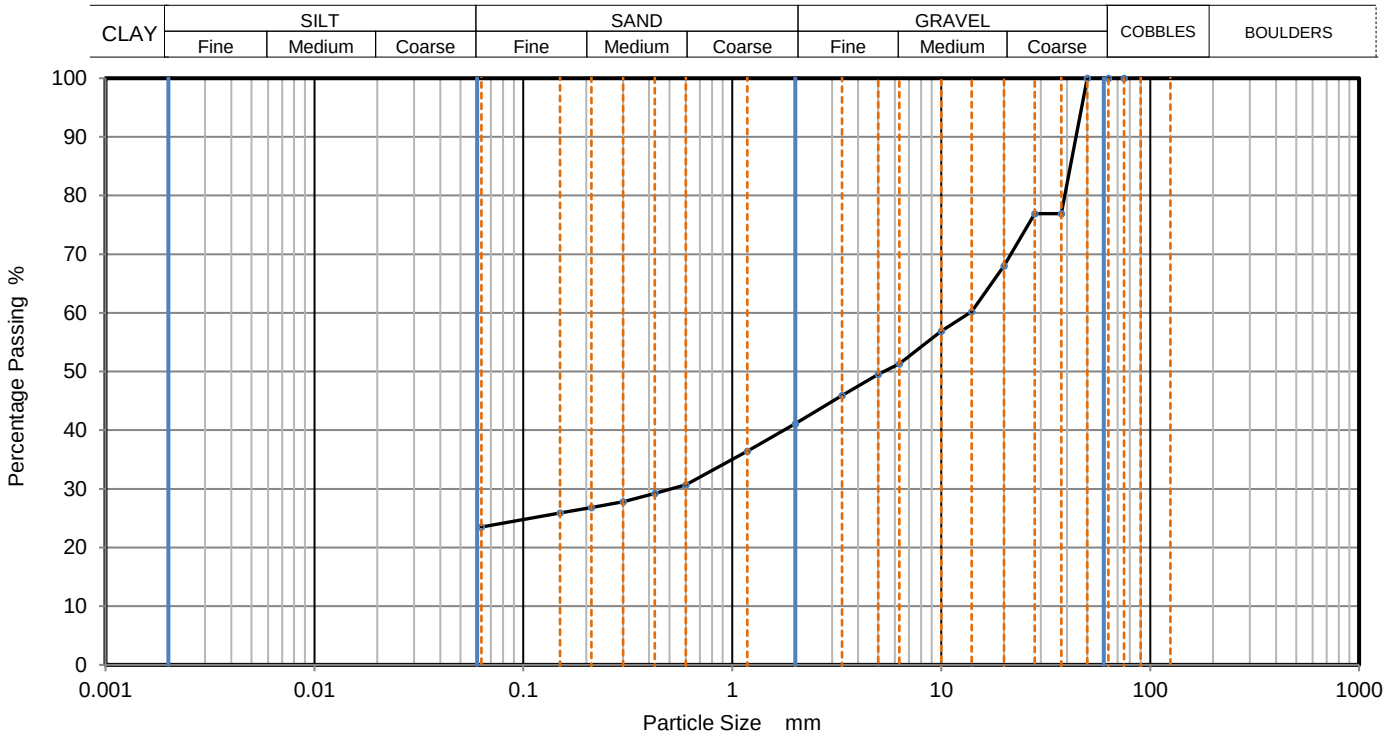
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH02
Site Name	Ballivor Wind Farm			Sample No.	10
Soil Description	Grey sandy very silty coarse GRAVEL.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303233



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	77		
28	77		
20	68		
14	60		
10	57		
6.3	51		
5	50		
3.35	46		
2	41		
1.18	36		
0.6	31		
0.425	29		
0.3	28		
0.212	27		
0.15	26		
0.063	24		

Dry Mass of sample, g	669

Sample Proportions	% dry mass
Very coarse	0
Gravel	59
Sand	18
Fines <0.063mm	23

Grading Analysis		
D100	mm	
D60	mm	13.8
D30	mm	0.515
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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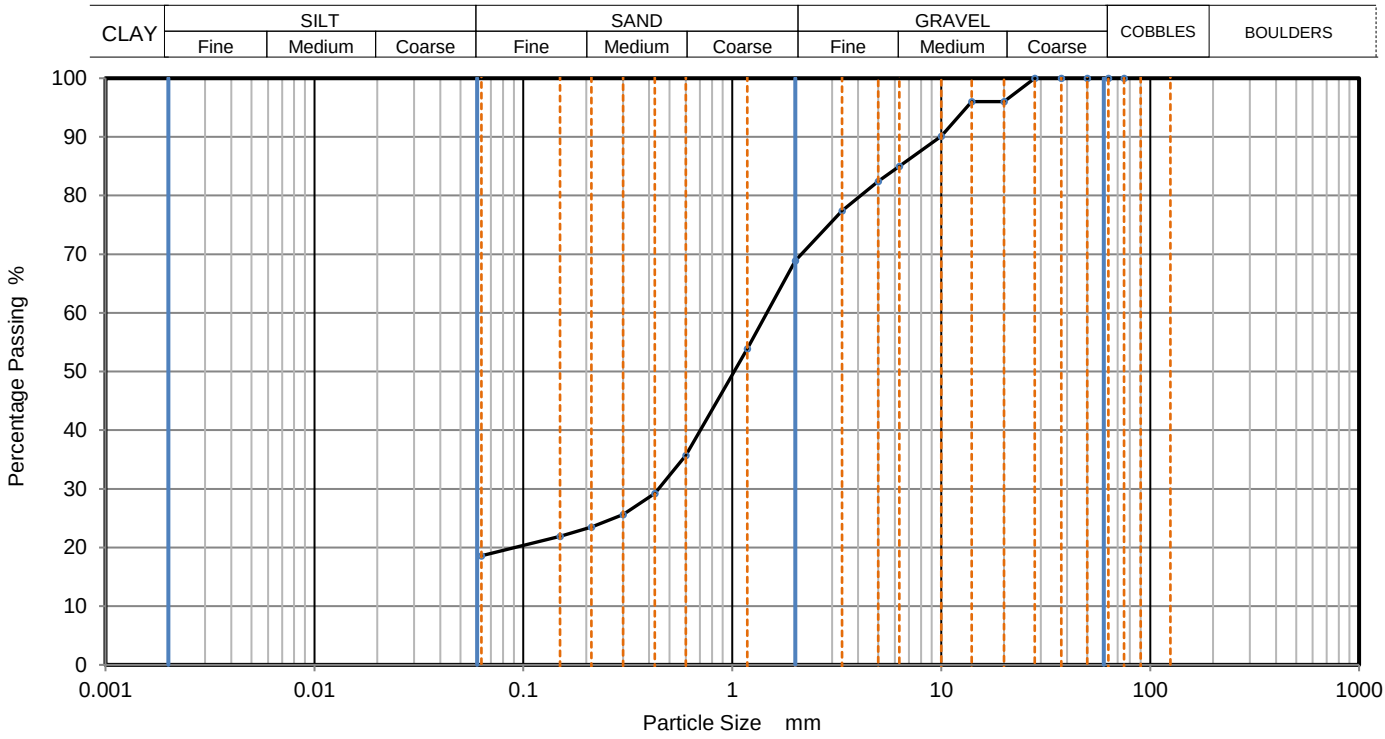
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH02
Site Name	Ballivor Wind Farm			Sample No.	13
Soil Description	Dark grey silty very gravelly coarse SAND.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303236



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	96		
10	90		
6.3	85		
5	82		
3.35	77		
2	69		
1.18	54		
0.6	36		
0.425	29		
0.3	26		
0.212	24		
0.15	22		
0.063	19		

Dry Mass of sample, g	667

Sample Proportions	% dry mass
Very coarse	0
Gravel	31
Sand	50
Fines <0.063mm	19

Grading Analysis		
D100	mm	
D60	mm	1.46
D30	mm	0.442
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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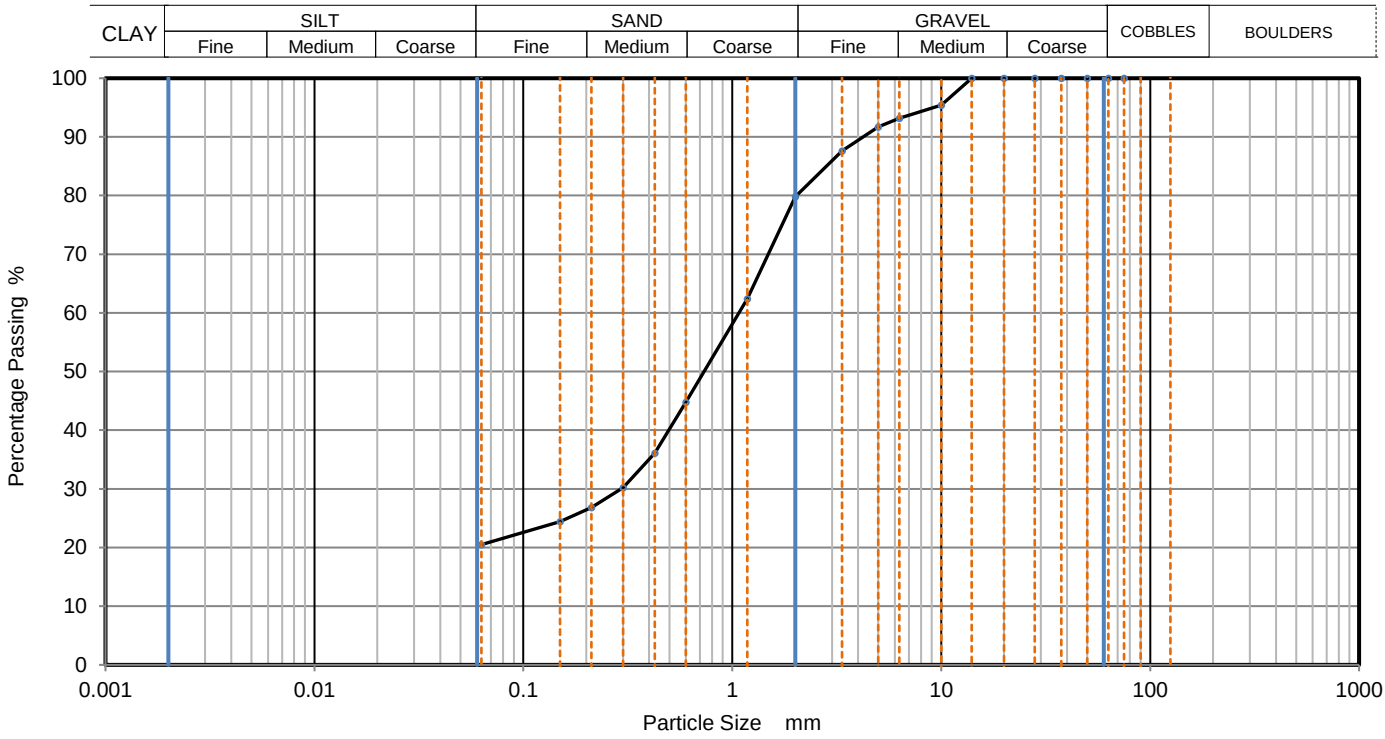
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH02
Site Name	Ballivor Wind Farm			Sample No.	16
Soil Description	Dark brown very gravelly very silty coarse SAND.			Depth, m	5.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303239



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	95		
6.3	93		
5	92		
3.35	88		
2	80		
1.18	62		
0.6	45		
0.425	36		
0.3	30		
0.212	27		
0.15	24		
0.063	21		

Dry Mass of sample, g	539

Sample Proportions	% dry mass
Very coarse	0
Gravel	20
Sand	59
Fines <0.063mm	21

Grading Analysis		
D100	mm	
D60	mm	1.08
D30	mm	0.294
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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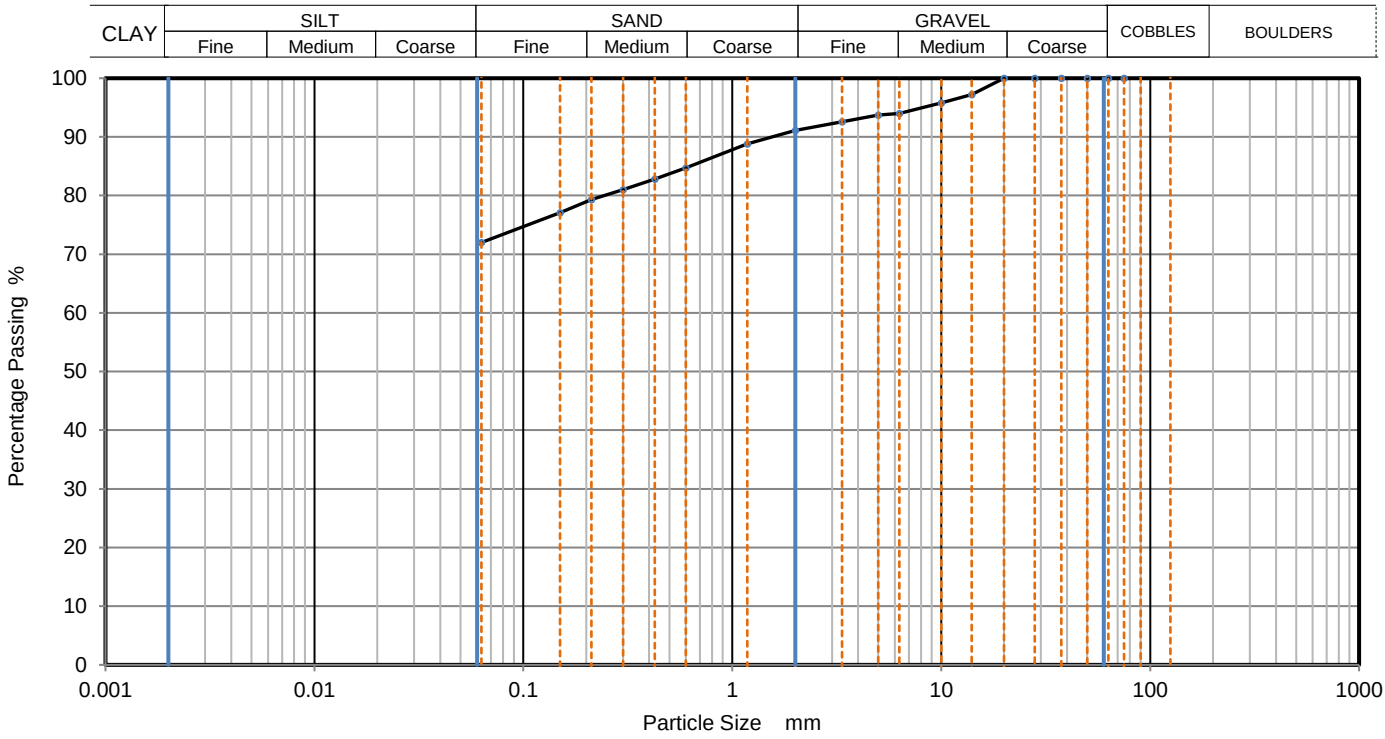
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

PARTICLE SIZE DISTRIBUTION

				Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH03A
Site Name	Ballivor Wind Farm			Sample No.	4
Soil Description	Grey slightly gravelly slightly sandy SILT.			Depth, m	1.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303250



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	96		
6.3	94		
5	94		
3.35	93		
2	91		
1.18	89		
0.6	85		
0.425	83		
0.3	81		
0.212	79		
0.15	77		
0.063	72		

Dry Mass of sample, g	430

Sample Proportions	% dry mass
Very coarse	0
Gravel	9
Sand	19
Fines <0.063mm	72

Grading Analysis		
D100	mm	
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Operator	Checked	Approved	Sheet printed	
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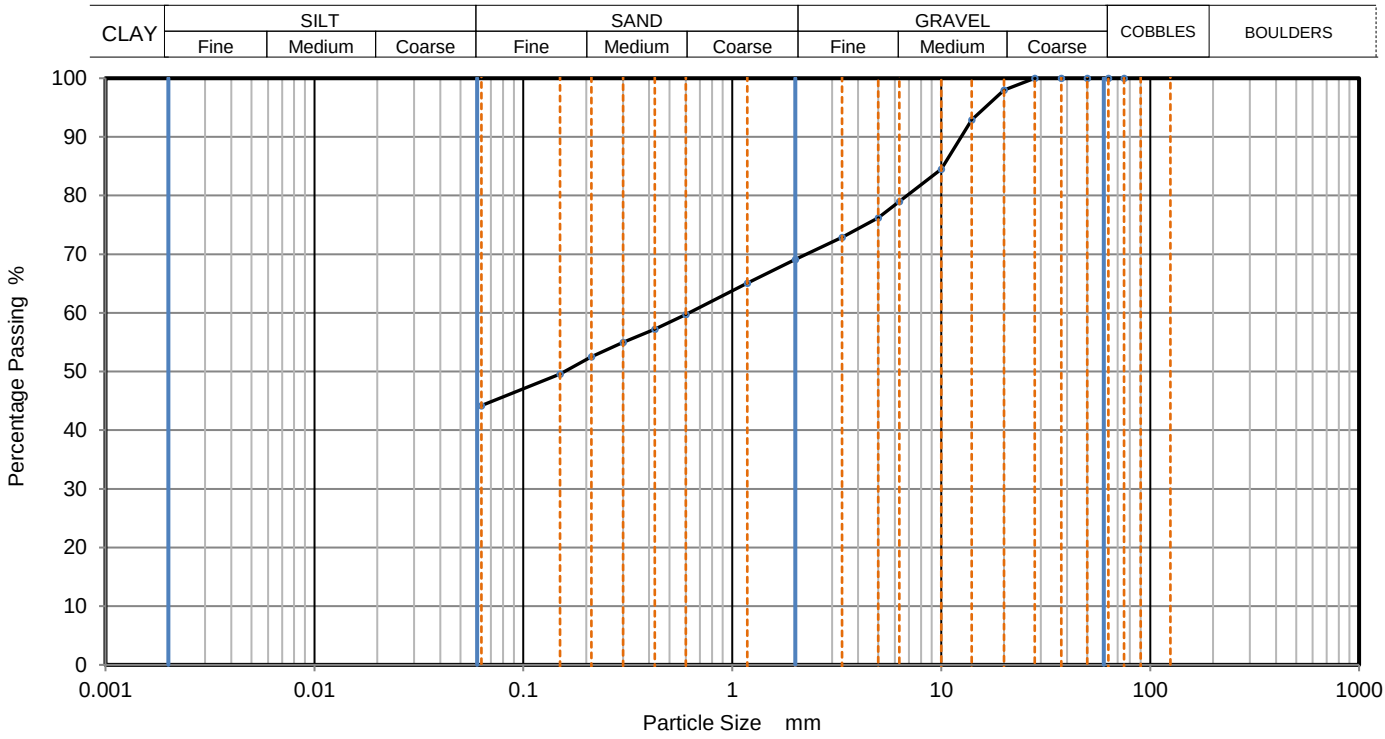
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH03A
Site Name	Ballivor Wind Farm			Sample No.	7
Soil Description	Dark grey slightly sandy slightly gravelly SILT.			Depth, m	2.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303253



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
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63	100		
50	100		
37.5	100		
28	100		
20	98		
14	93		
10	85		
6.3	79		
5	76		
3.35	73		
2	69		
1.18	65		
0.6	60		
0.425	57		
0.3	55		
0.212	53		
0.15	50		
0.063	44		

Dry Mass of sample, g	528

Sample Proportions	% dry mass
Very coarse	0
Gravel	31
Sand	25
Fines <0.063mm	44

Grading Analysis		
D100	mm	
D60	mm	0.626
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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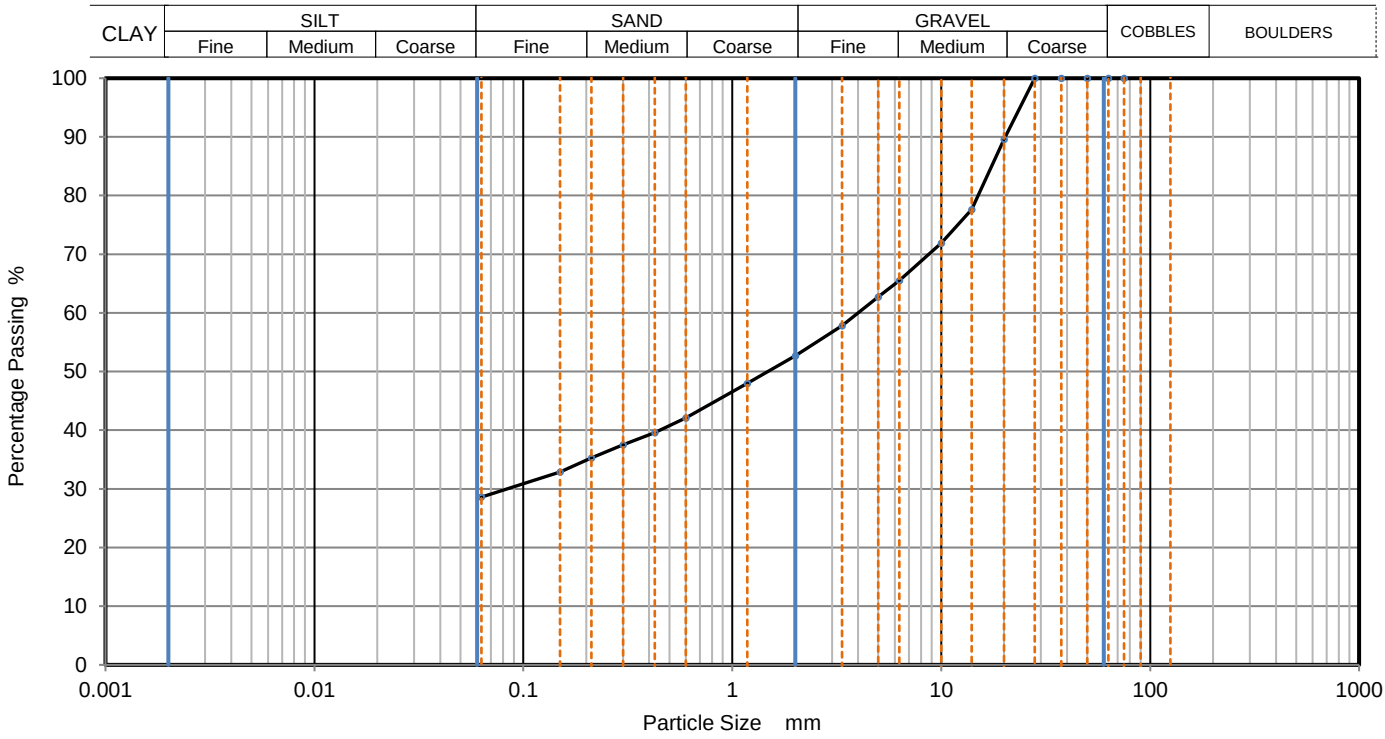
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH03A
Site Name	Ballivor Wind Farm			Sample No.	10
Soil Description	Dark grey very sandy very silty medium GRAVEL.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303256



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	90		
14	78		
10	72		
6.3	66		
5	63		
3.35	58		
2	53		
1.18	48		
0.6	42		
0.425	40		
0.3	38		
0.212	35		
0.15	33		
0.063	29		

Dry Mass of sample, g	646

Sample Proportions	% dry mass
Very coarse	0
Gravel	47
Sand	24
Fines <0.063mm	29

Grading Analysis		
D100	mm	
D60	mm	4
D30	mm	0.0833
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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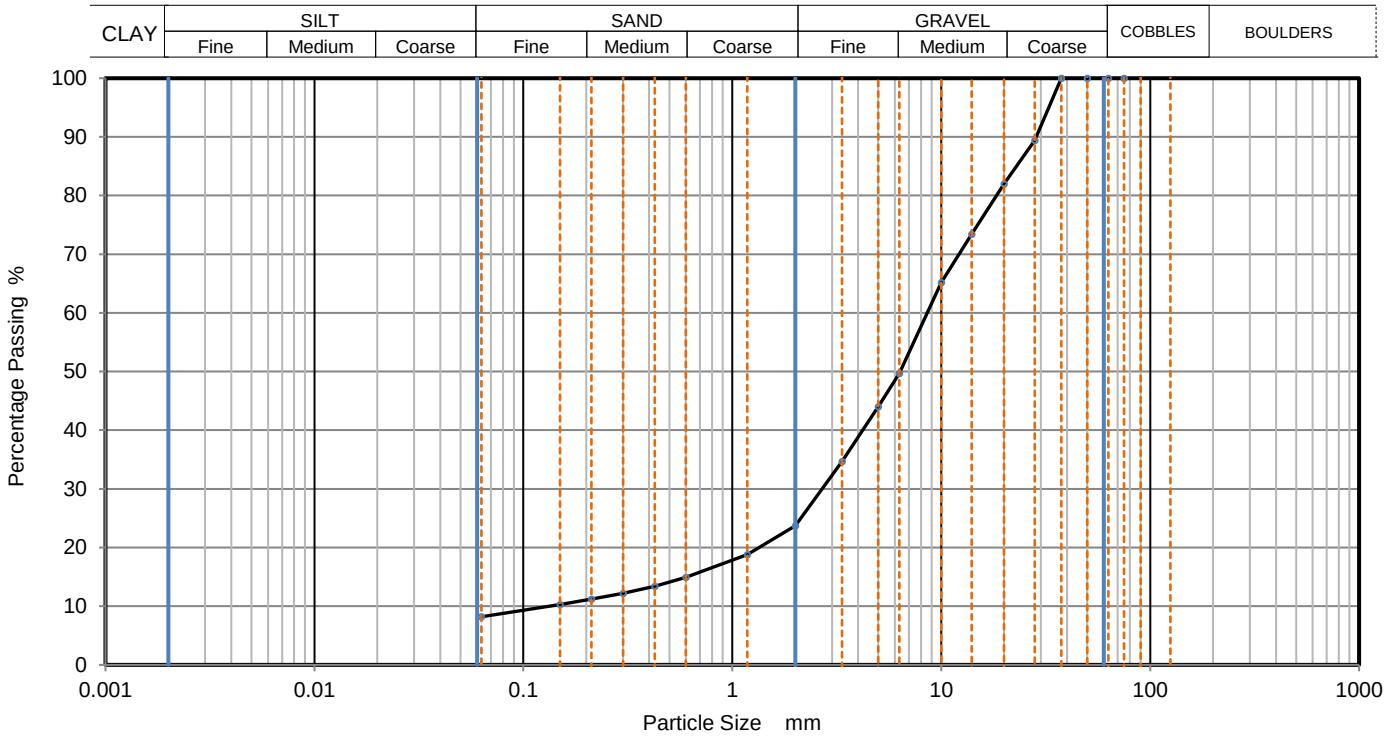
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-BH03A
Site Name	Ballivor Wind Farm			Sample No.	13
Soil Description	Grey silty sandy f,m,c GRAVEL.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210303259



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
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63	100		
50	100		
37.5	100		
28	89		
20	82		
14	73		
10	65		
6.3	50		
5	44		
3.35	35		
2	24		
1.18	19		
0.6	15		
0.425	13		
0.3	12		
0.212	11		
0.15	10		
0.063	8		

Dry Mass of sample, g	863

Sample Proportions	% dry mass
Very coarse	0
Gravel	76
Sand	16
Fines <0.063mm	8

Grading Analysis		
D100	mm	
D60	mm	8.56
D30	mm	2.69
D10	mm	0.132
Uniformity Coefficient		65
Curvature Coefficient		6.4

Remarks

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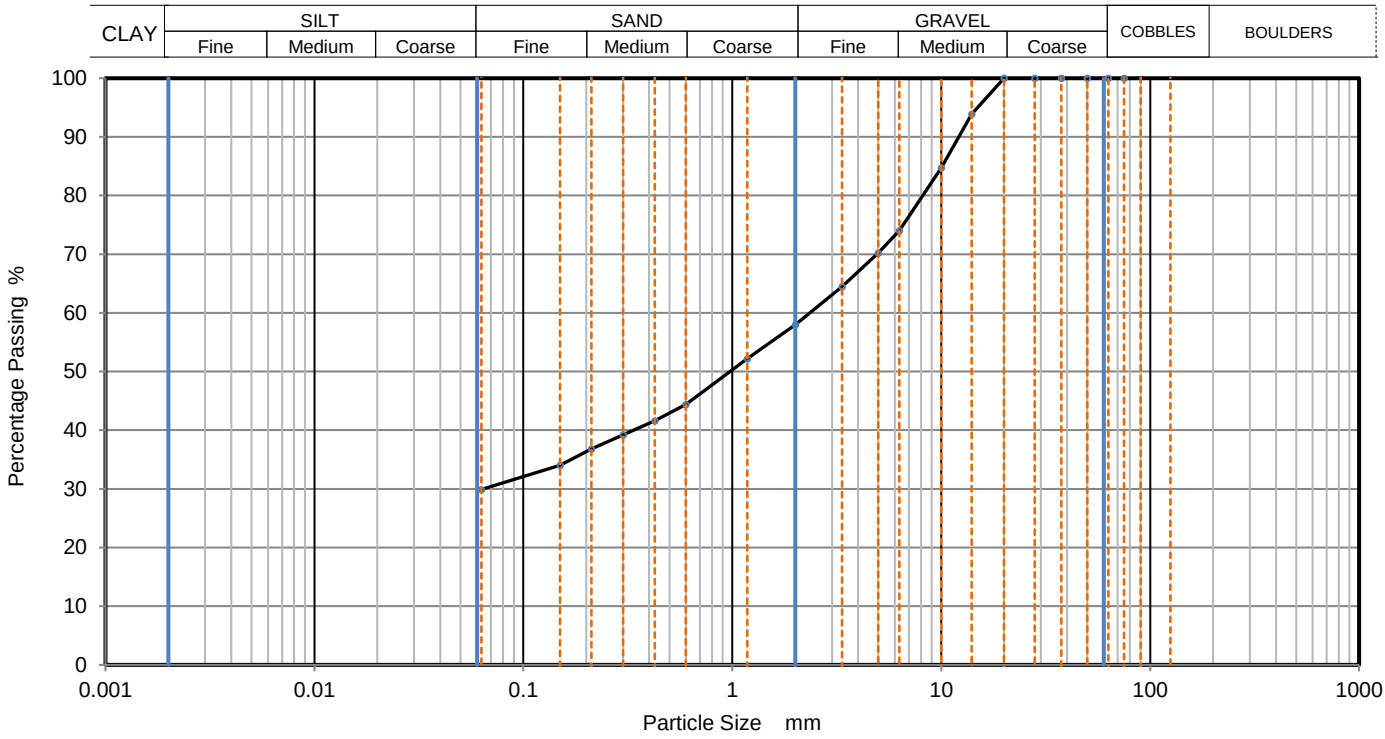
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-TP01
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark grey very sandy very silty medium GRAVEL.			Depth, m	3.20
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021748



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	94		
10	85		
6.3	74		
5	70		
3.35	65		
2	58		
1.18	52		
0.6	44		
0.425	42		
0.3	39		
0.212	37		
0.15	34		
0.063	30		

Dry Mass of sample, g	742

Sample Proportions	% dry mass
Very coarse	0
Gravel	42
Sand	28
Fines <0.063mm	30

Grading Analysis		
D100	mm	
D60	mm	2.35
D30	mm	0.0646
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Operator	Checked	Approved	Sheet printed	
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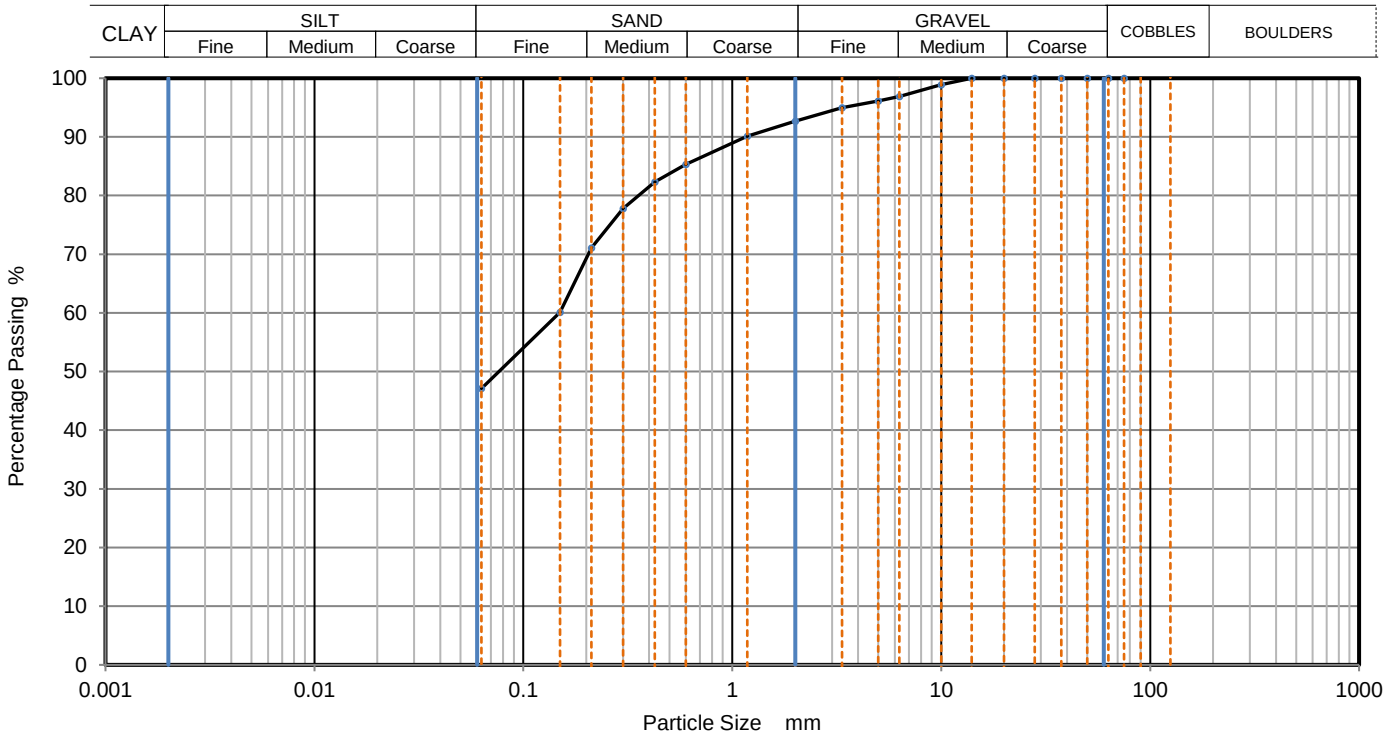
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-TP01
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Dark grey slightly gravelly sandy SILT. Sand is fine.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021749



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	97		
5	96		
3.35	95		
2	93		
1.18	90		
0.6	85		
0.425	82		
0.3	78		
0.212	71		
0.15	60		
0.063	47		

Dry Mass of sample, g	553

Sample Proportions	% dry mass
Very coarse	0
Gravel	7
Sand	46
Fines <0.063mm	47

Grading Analysis		
D100	mm	
D60	mm	0.149
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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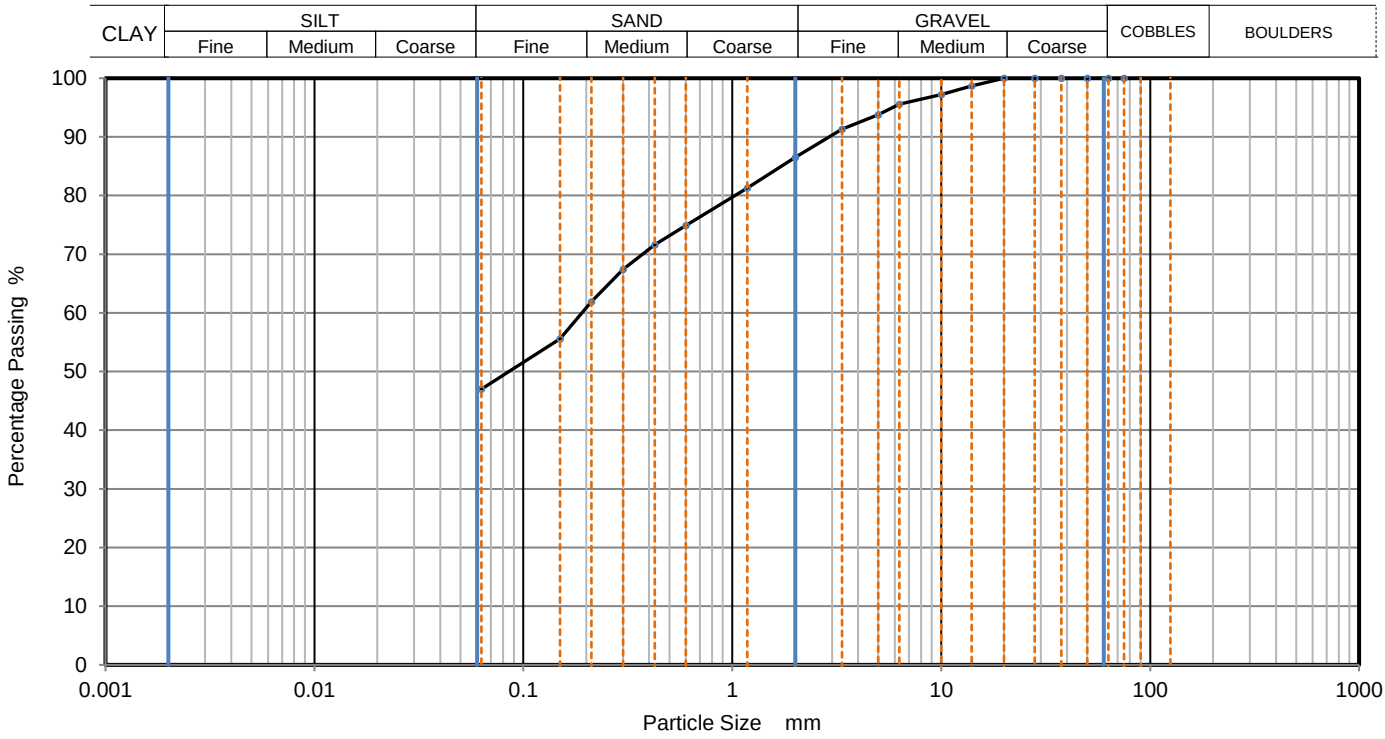
Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	23/04/2021 09:44	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-TP02
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark brown gravelly sandy SILT.			Depth, m	1.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021751



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	97		
6.3	96		
5	94		
3.35	91		
2	87		
1.18	81		
0.6	75		
0.425	72		
0.3	67		
0.212	62		
0.15	56		
0.063	47		

Dry Mass of sample, g	635

Sample Proportions	% dry mass
Very coarse	0
Gravel	14
Sand	40
Fines <0.063mm	47

Grading Analysis		
D100	mm	
D60	mm	0.191
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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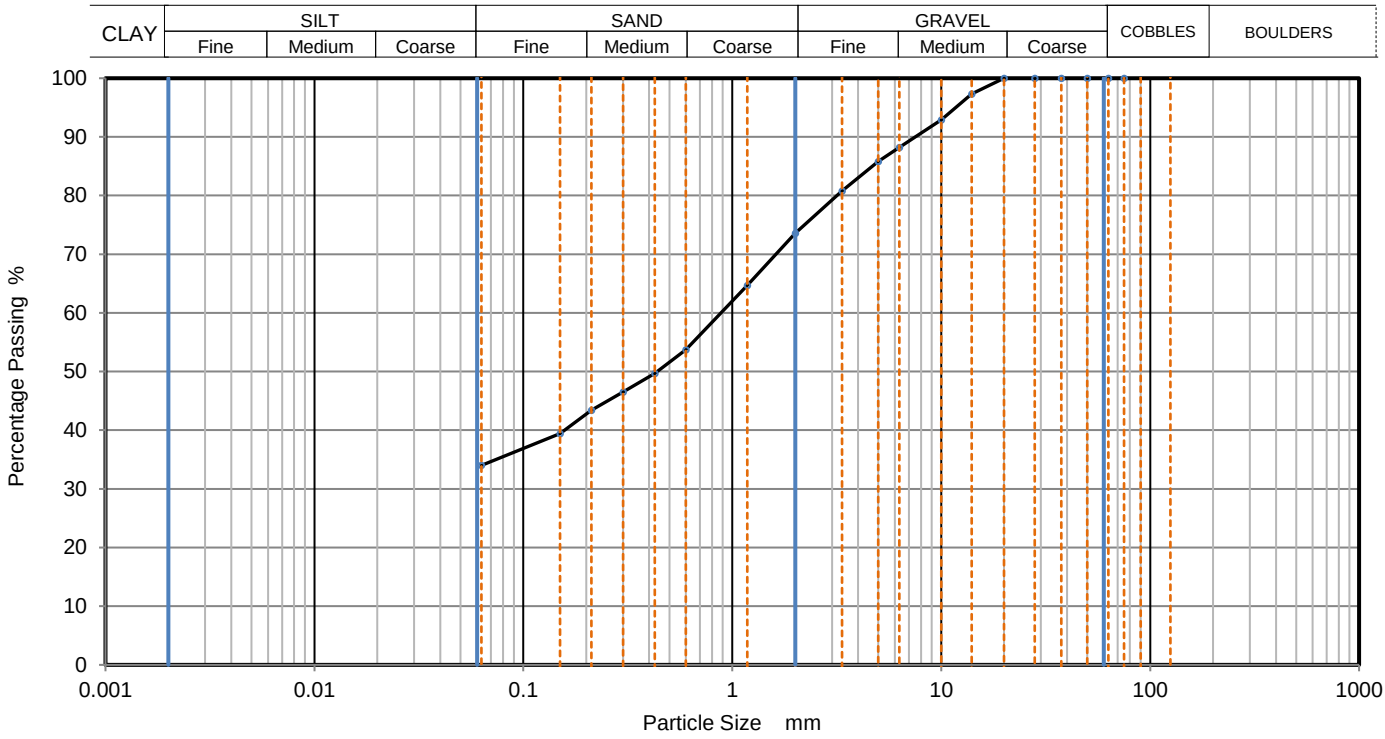
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	BPA-TP02
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Dark grey very gravelly very silty coarse SAND.			Depth, m	2.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021753



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	93		
6.3	88		
5	86		
3.35	81		
2	74		
1.18	65		
0.6	54		
0.425	50		
0.3	47		
0.212	43		
0.15	39		
0.063	34		

Dry Mass of sample, g	667

Sample Proportions	% dry mass
Very coarse	0
Gravel	26
Sand	40
Fines <0.063mm	34

Grading Analysis		
D100	mm	
D60	mm	0.885
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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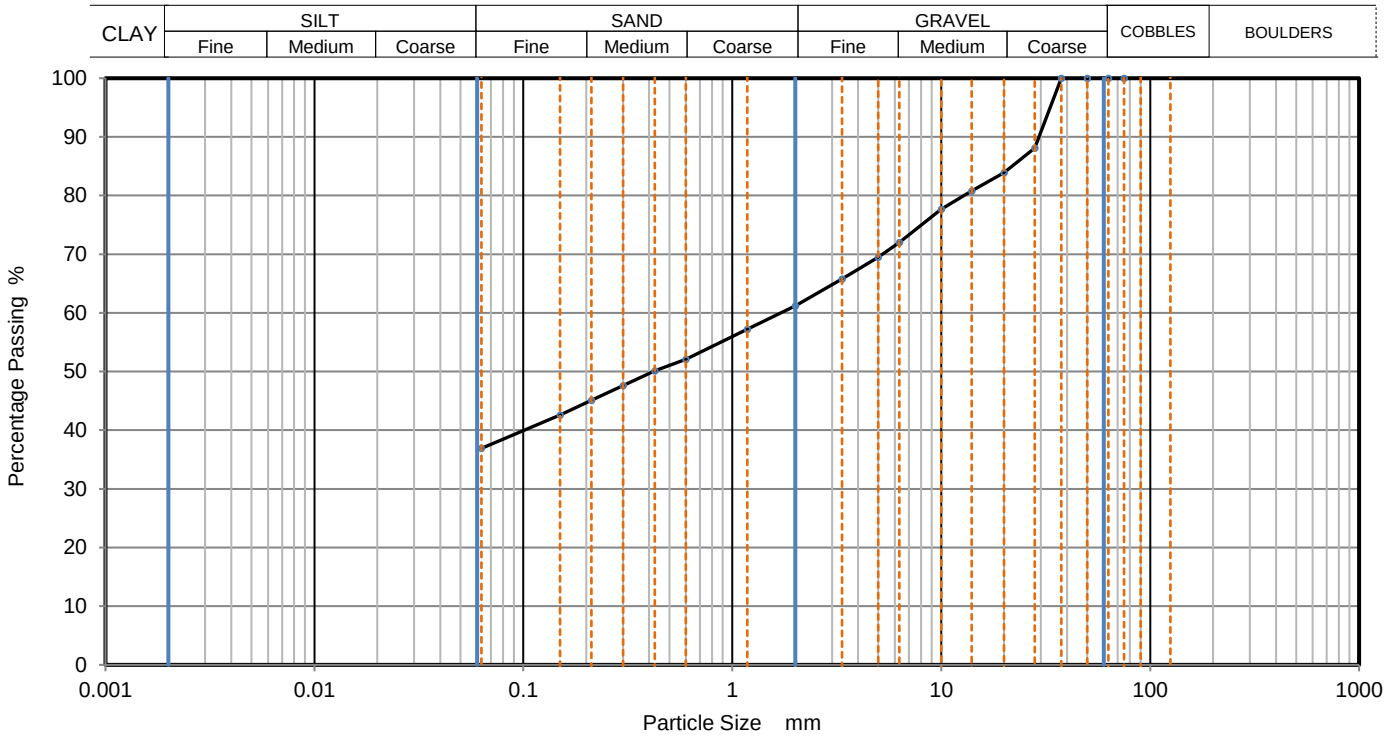
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-02
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Light grey slightly sandy gravelly SILT.			Depth, m	2.80
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021760



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	88		
20	84		
14	81		
10	78		
6.3	72		
5	70		
3.35	66		
2	61		
1.18	57		
0.6	52		
0.425	50		
0.3	48		
0.212	45		
0.15	43		
0.063	37		

Dry Mass of sample, g	811

Sample Proportions	% dry mass
Very coarse	0
Gravel	39
Sand	24
Fines <0.063mm	37

Grading Analysis		
D100	mm	
D60	mm	1.7
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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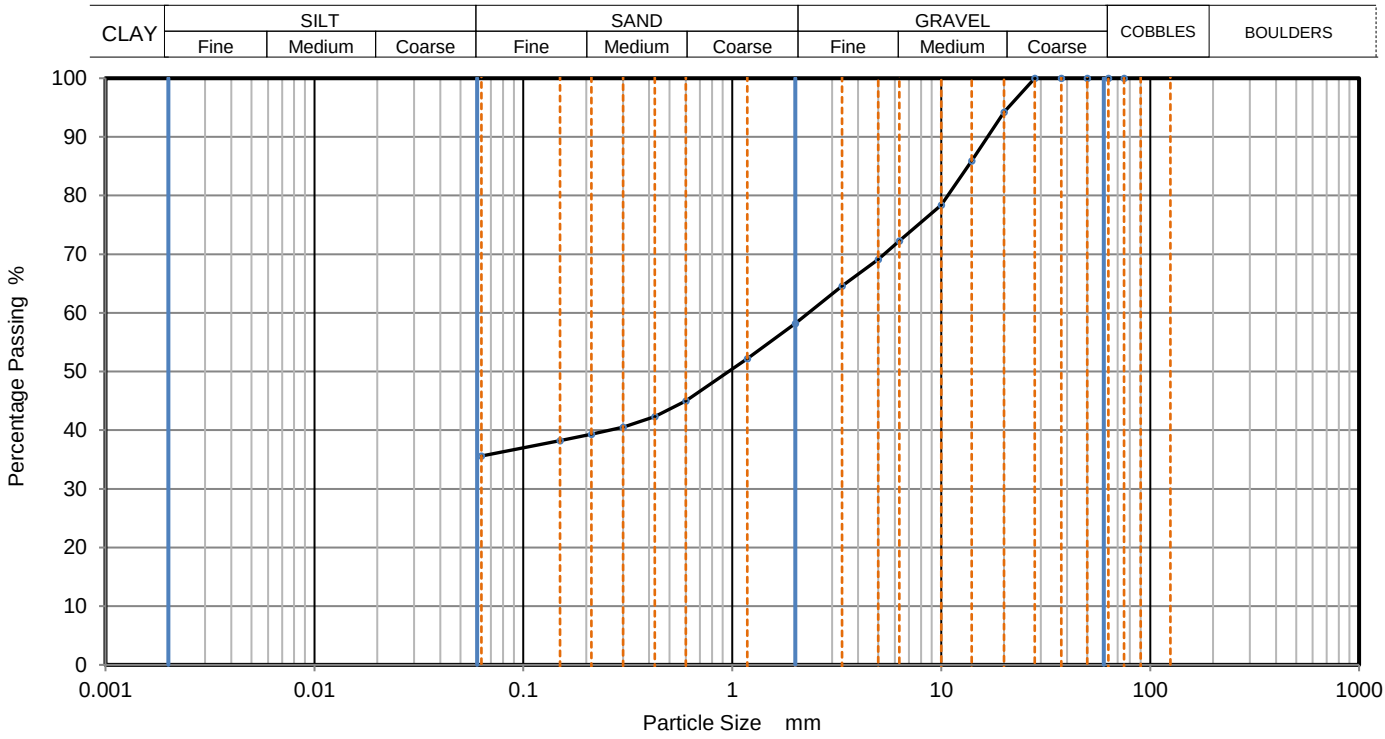
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-04
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Grey slightly sandy gravelly SILT. Gravel is medium.			Depth, m	1.70
Specimen Reference		Specimen Depth	m	Sample Type	D
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021769



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	94		
14	86		
10	78		
6.3	72		
5	69		
3.35	65		
2	58		
1.18	52		
0.6	45		
0.425	42		
0.3	41		
0.212	39		
0.15	38		
0.063	36		

Dry Mass of sample, g	744

Sample Proportions	% dry mass
Very coarse	0
Gravel	42
Sand	23
Fines <0.063mm	36

Grading Analysis		
D100	mm	
D60	mm	2.31
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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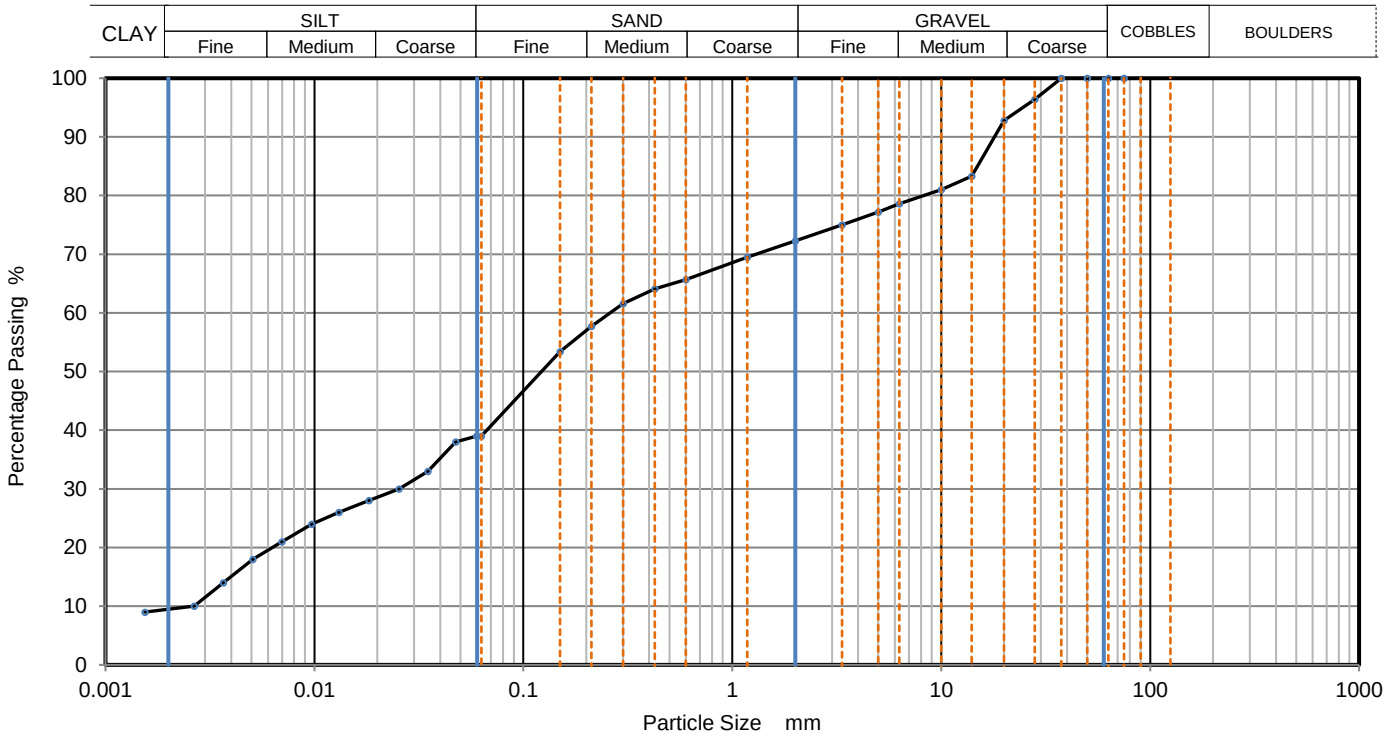
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-08
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Light grey slightly gravelly slightly sandy SILT.			Depth, m	2.20
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL12021021778



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0596	39
		0.0474	38
75	100	0.0349	33
63	100	0.0254	30
50	100	0.0182	28
37.5	100	0.0131	26
28	96	0.0097	24
20	93	0.0070	21
14	83	0.0051	18
10	81	0.0037	14
6.3	79	0.0027	10
5	77	0.0015	9
3.35	75		
2	72		
1.18	70		
0.6	66	Particle density (assumed)	
0.425	64	2.65	Mg/m3
0.3	62		
0.212	58		
0.15	53		
0.063	39		

Dry Mass of sample, g	854

Sample Proportions	% dry mass
Very coarse	0
Gravel	28
Sand	33
Silt	29
Clay	10

Grading Analysis		
D100	mm	
D60	mm	0.26
D30	mm	0.0261
D10	mm	0.00234
Uniformity Coefficient		110
Curvature Coefficient		1.1

Remarks

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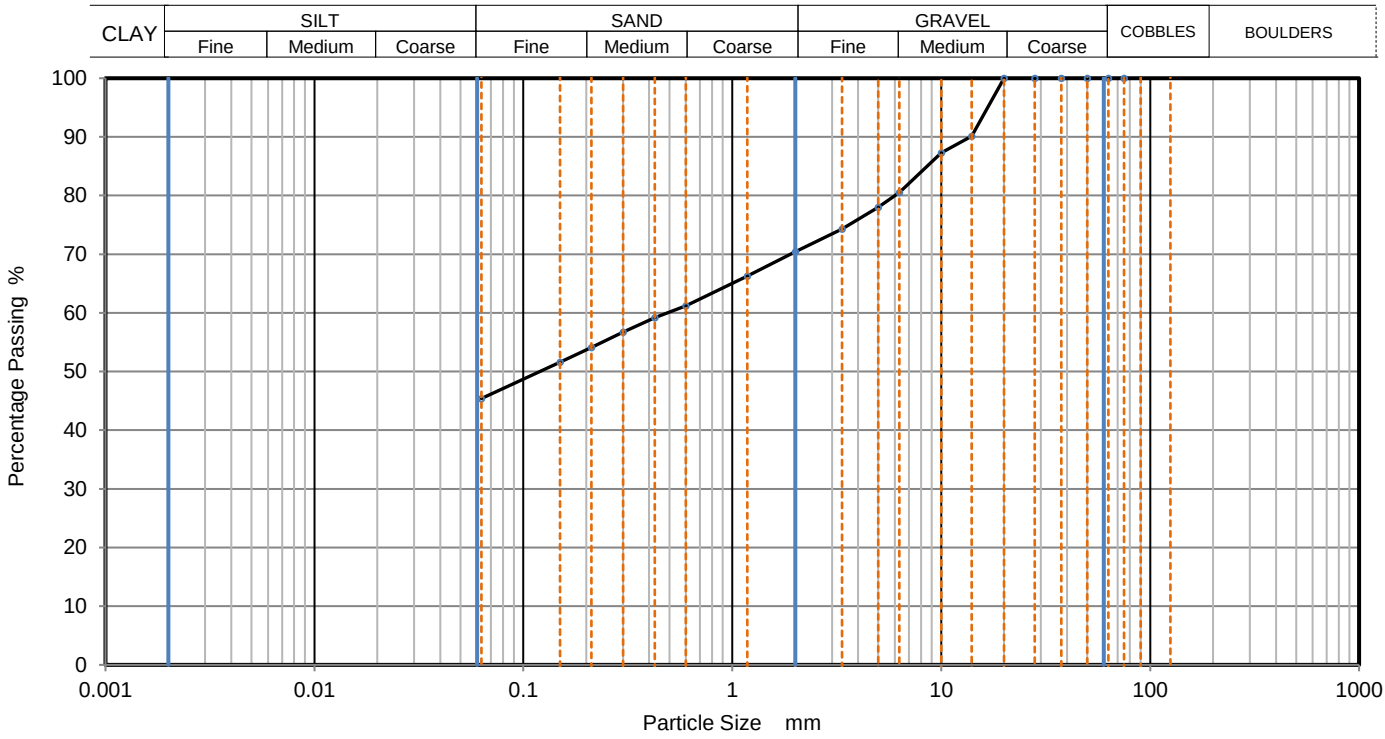
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-12
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Dark grey slightly sandy slightly gravelly SILT.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021793



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	90		
10	87		
6.3	81		
5	78		
3.35	74		
2	70		
1.18	66		
0.6	61		
0.425	59		
0.3	57		
0.212	54		
0.15	52		
0.063	45		

Dry Mass of sample, g	751

Sample Proportions	% dry mass
Very coarse	0
Gravel	30
Sand	25
Fines <0.063mm	45

Grading Analysis		
D100	mm	
D60	mm	0.489
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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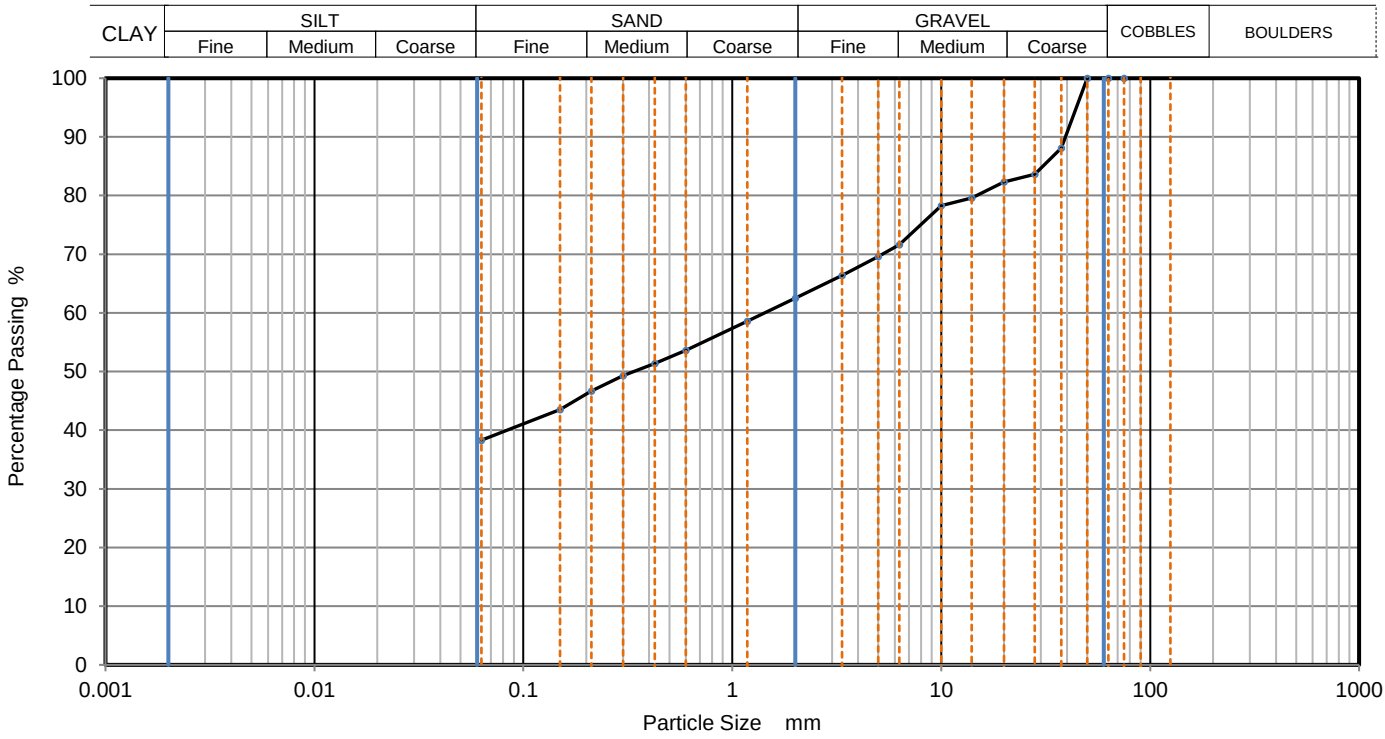
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-13
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Grey slightly sandy gravelly clayey SILT.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021799



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	88		
28	84		
20	82		
14	80		
10	78		
6.3	72		
5	70		
3.35	66		
2	63		
1.18	59		
0.6	54		
0.425	51		
0.3	49		
0.212	47		
0.15	44		
0.063	38		

Dry Mass of sample, g	925

Sample Proportions	% dry mass
Very coarse	0
Gravel	38
Sand	24
Fines <0.063mm	38

Grading Analysis		
D100	mm	
D60	mm	1.43
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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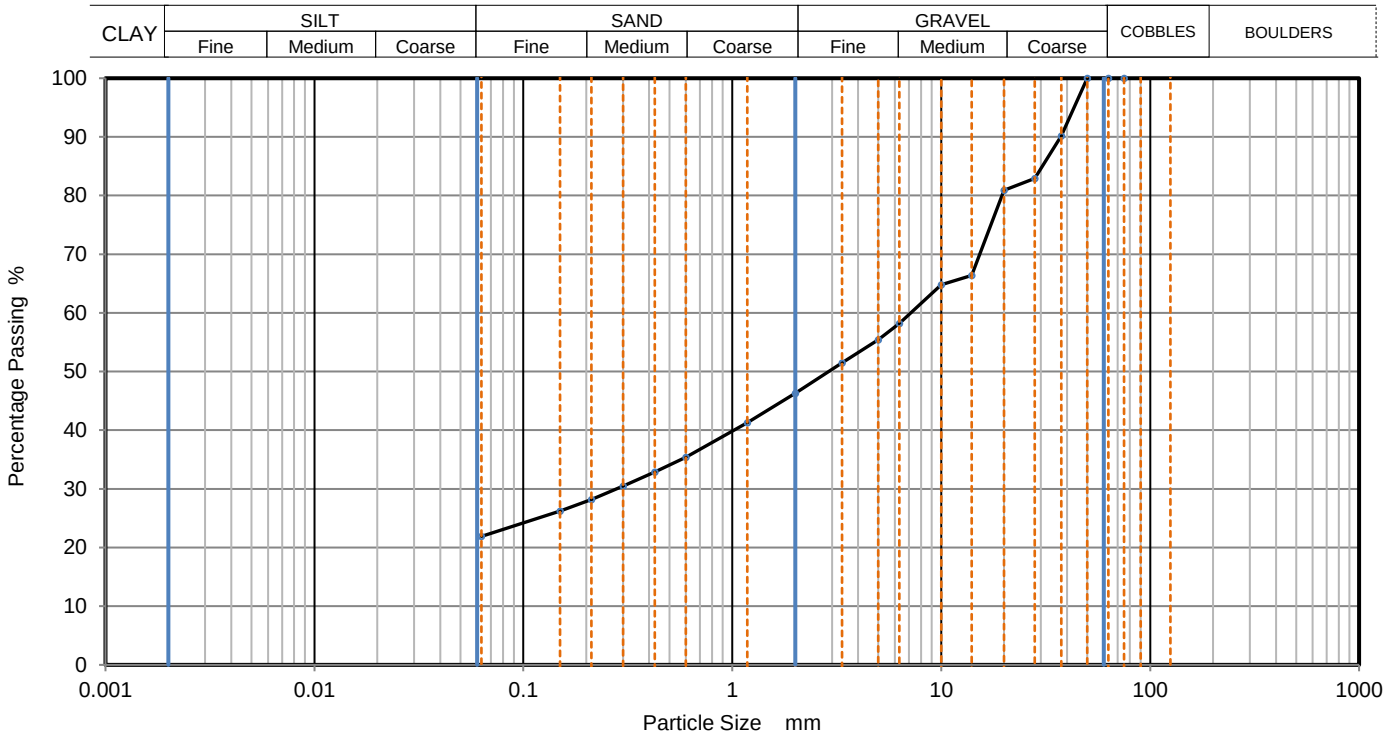
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-18
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Dark grey very silty very sandy medium GRAVEL.			Depth, m	3.20
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210217114



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	90		
28	83		
20	81		
14	66		
10	65		
6.3	58		
5	55		
3.35	52		
2	46		
1.18	41		
0.6	35		
0.425	33		
0.3	31		
0.212	28		
0.15	26		
0.063	22		

Dry Mass of sample, g	918

Sample Proportions	% dry mass
Very coarse	0
Gravel	54
Sand	24
Fines <0.063mm	22

Grading Analysis		
D100	mm	
D60	mm	7.16
D30	mm	0.278
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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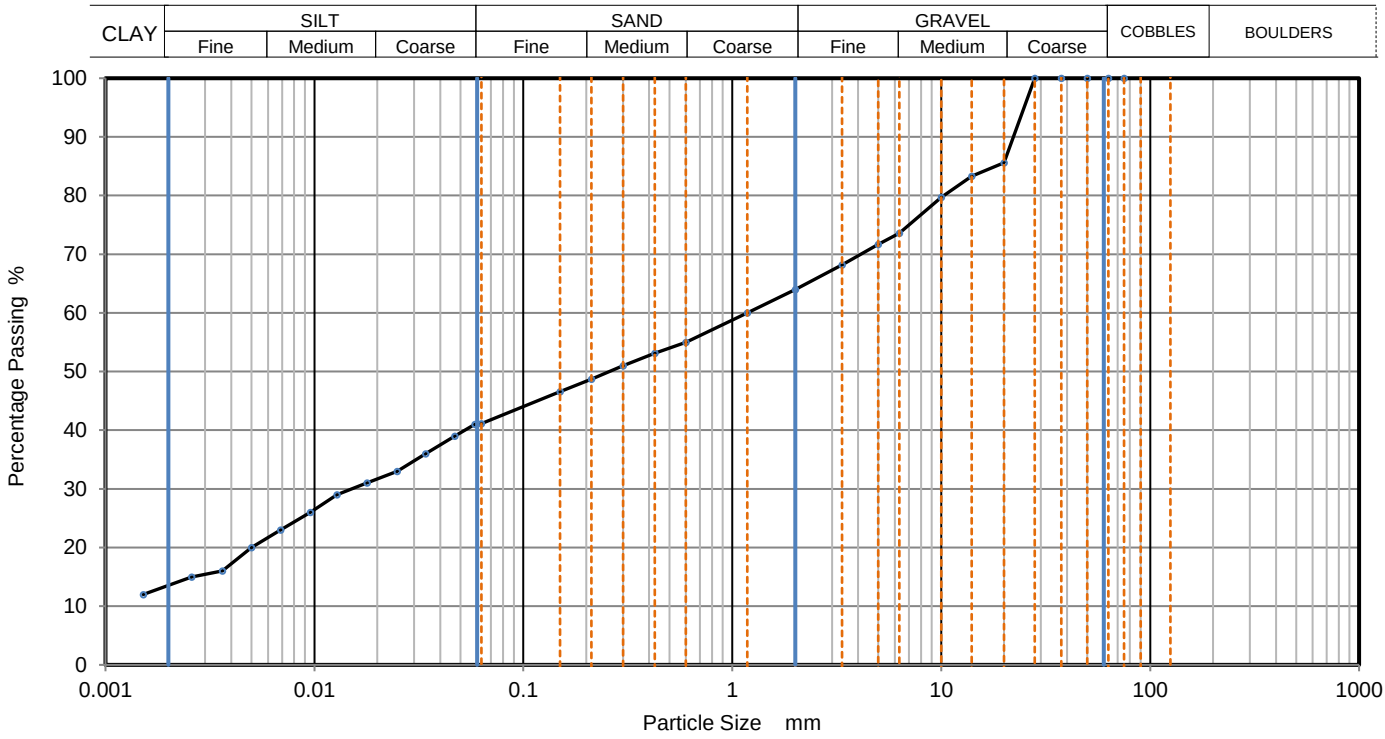
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-20
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Dark grey slightly sandy gravelly SILT.			Depth, m	2.40
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL120210217117



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0586	41
		0.0470	39
75	100	0.0341	36
63	100	0.0249	33
50	100	0.0179	31
37.5	100	0.0128	29
28	100	0.0096	26
20	86	0.0069	23
14	83	0.0050	20
10	80	0.0036	16
6.3	74	0.0026	15
5	72	0.0015	12
3.35	68		
2	64		
1.18	60		
0.6	55	Particle density (assumed)	
0.425	53	2.65 Mg/m3	
0.3	51		
0.212	49		
0.15	47		
0.063	41		

Dry Mass of sample, g	984

Sample Proportions	% dry mass
Very coarse	0
Gravel	36
Sand	23
Silt	28
Clay	14

Grading Analysis		
D100	mm	
D60	mm	1.18
D30	mm	0.0154
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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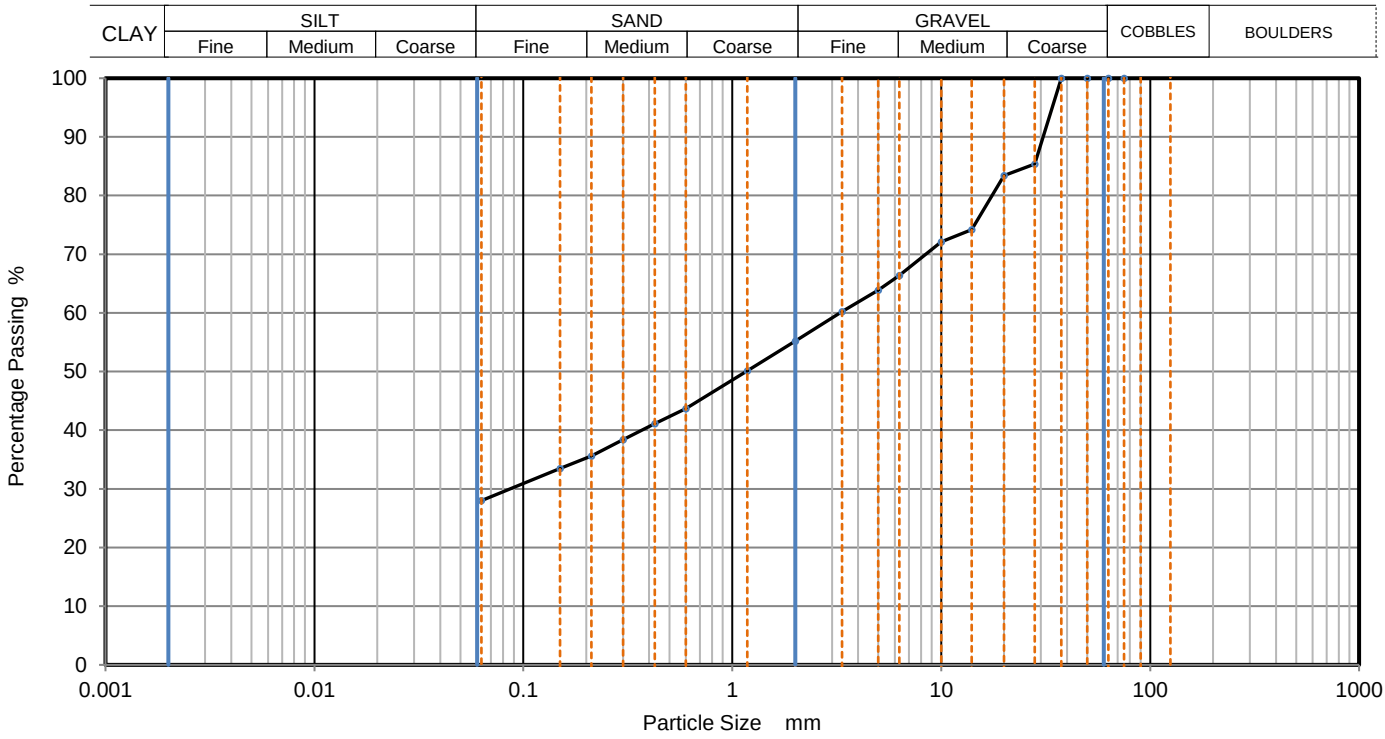
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-24
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Dark grey very sandy very silty GRAVEL.			Depth, m	3.30
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210217128



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	85		
20	83		
14	74		
10	72		
6.3	66		
5	64		
3.35	60		
2	55		
1.18	50		
0.6	44		
0.425	41		
0.3	38		
0.212	36		
0.15	34		
0.063	28		

Dry Mass of sample, g	1019

Sample Proportions	% dry mass
Very coarse	0
Gravel	45
Sand	27
Fines <0.063mm	28

Grading Analysis		
D100	mm	
D60	mm	3.27
D30	mm	0.0862
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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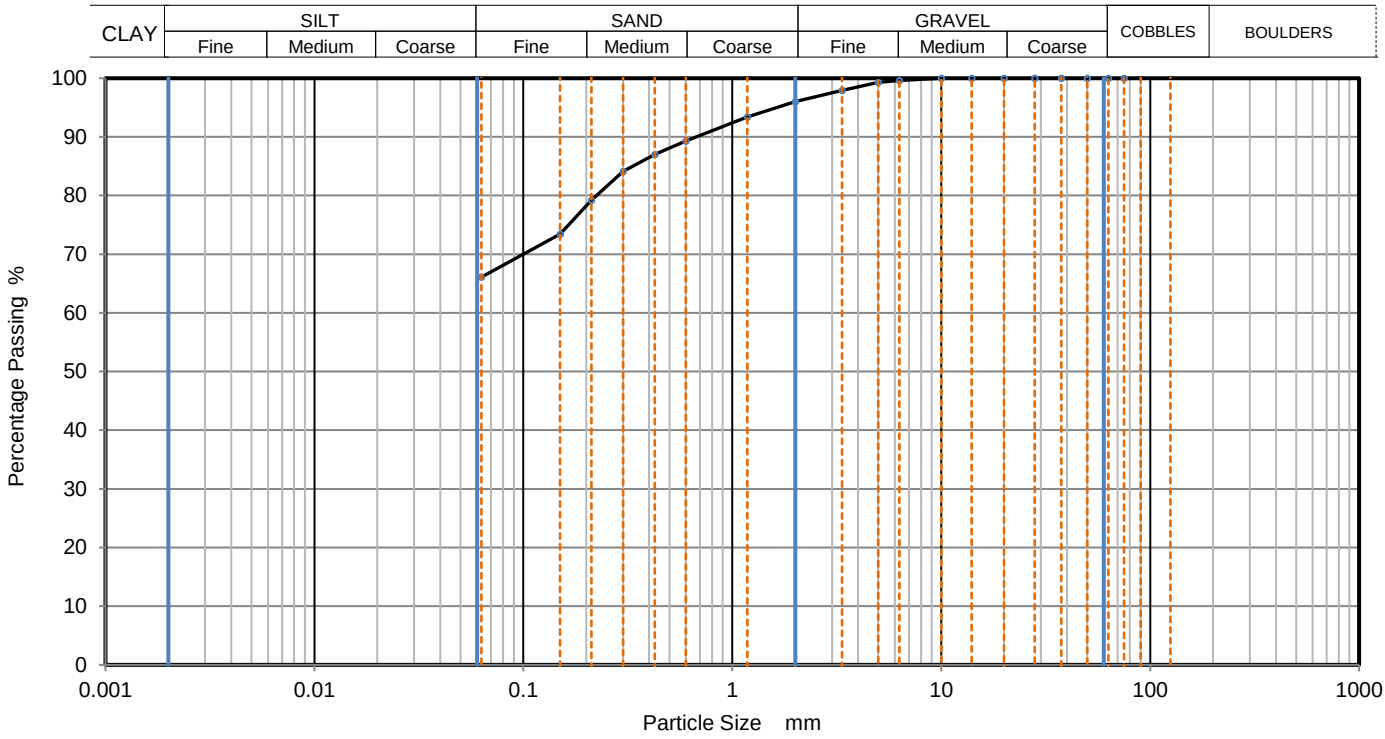
PARTICLE SIZE DISTRIBUTION

				Job Ref	**2020MH103**
				Borehole/Pit No.	TP-25
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark grey slightly gravelly slightly sandy SILT.			Depth, m	1.70
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210217131



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	98		
2	96		
1.18	93		
0.6	89		
0.425	87		
0.3	84		
0.212	79		
0.15	73		
0.063	66		

Dry Mass of sample, g: 642

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	30
Fines <0.063mm	66

Grading Analysis		
D100	mm	
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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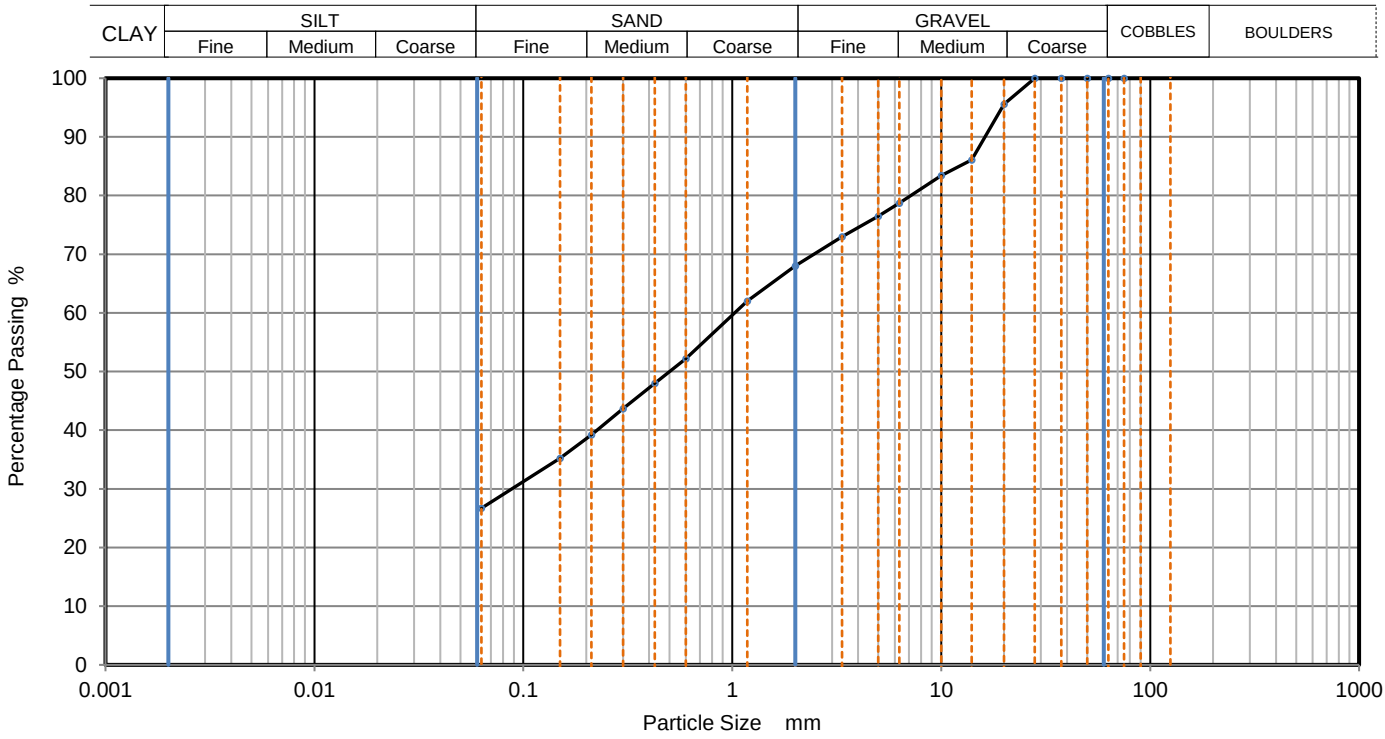
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-25
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Dark grey very silty very gravelly SAND.			Depth, m	2.80
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210217133



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	86		
10	83		
6.3	79		
5	77		
3.35	73		
2	68		
1.18	62		
0.6	52		
0.425	48		
0.3	44		
0.212	39		
0.15	35		
0.063	27		

Dry Mass of sample, g	724

Sample Proportions	% dry mass
Very coarse	0
Gravel	32
Sand	41
Fines <0.063mm	27

Grading Analysis		
D100	mm	
D60	mm	1.03
D30	mm	0.0881
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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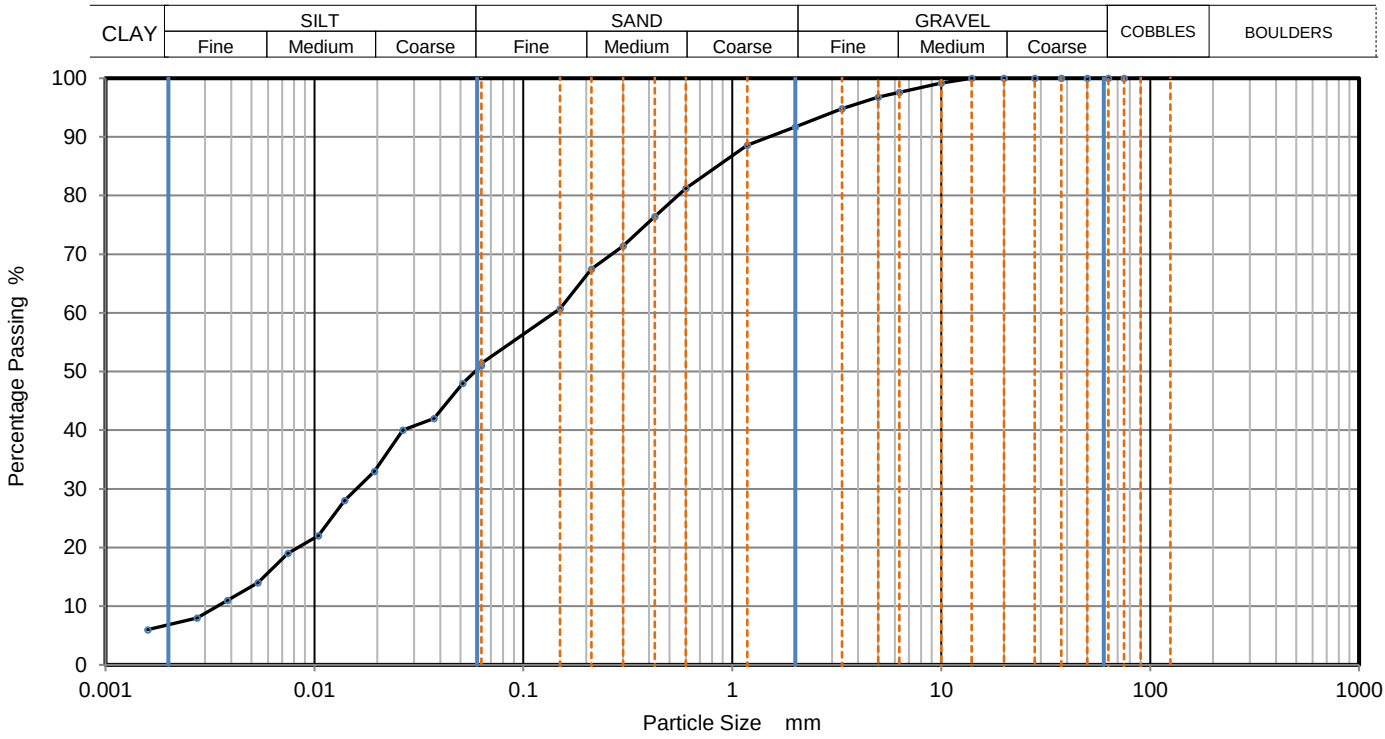
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-26
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Dark grey slightly gravelly sandy SILT.			Depth, m	3.40
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL120210217136



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	51
		0.0512	48
75	100	0.0373	42
63	100	0.0265	40
50	100	0.0194	33
37.5	100	0.0140	28
28	100	0.0104	22
20	100	0.0075	19
14	100	0.0054	14
10	99	0.0038	11
6.3	98	0.0027	8
5	97	0.0016	6
3.35	95		
2	92		
1.18	89		
0.6	81	Particle density (assumed)	
0.425	76	2.65	Mg/m3
0.3	71		
0.212	68		
0.15	61		
0.063	51		

Dry Mass of sample, g	687

Sample Proportions	% dry mass
Very coarse	0
Gravel	8
Sand	40
Silt	45
Clay	7

Grading Analysis		
D100	mm	
D60	mm	0.141
D30	mm	0.016
D10	mm	0.00348
Uniformity Coefficient		40
Curvature Coefficient		0.52

Remarks

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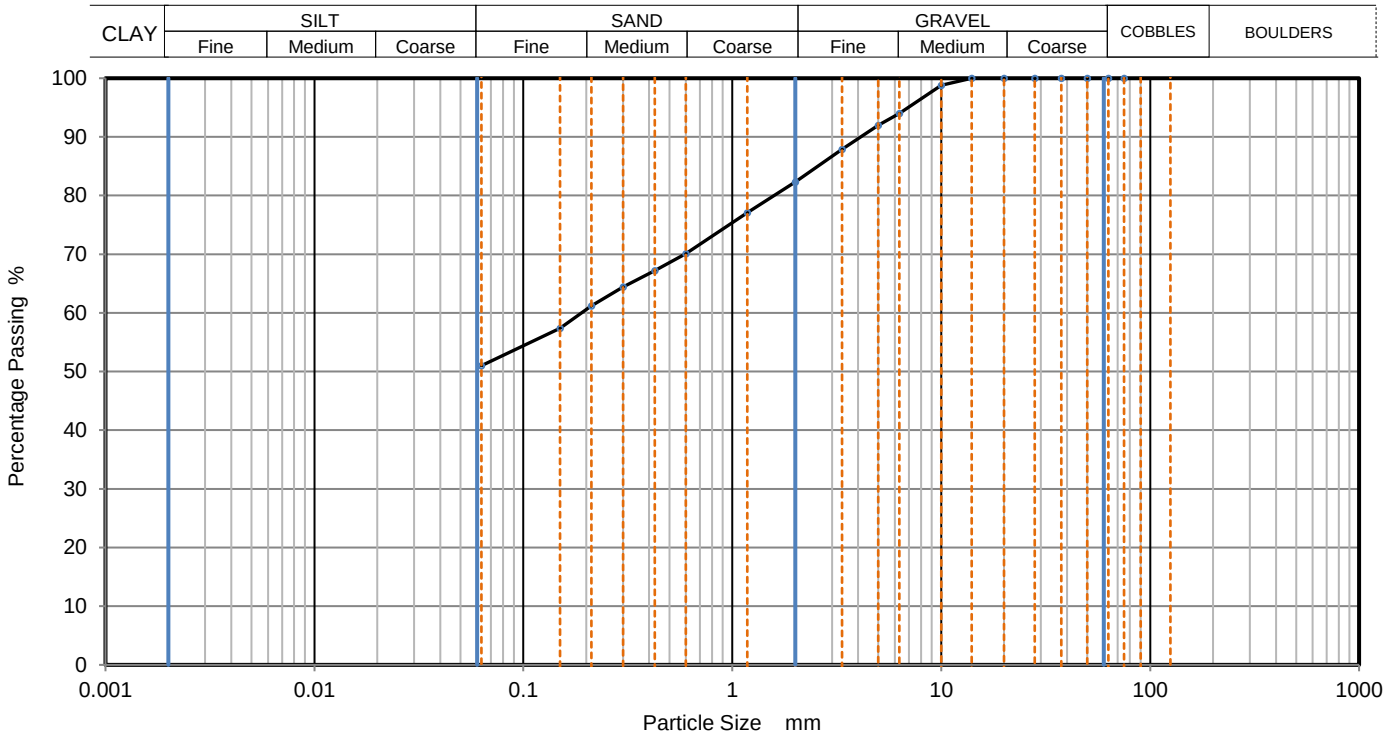
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-29
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Dark grey slightly gravelly slightly sandy SILT.			Depth, m	2.60
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210217147



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	94		
5	92		
3.35	88		
2	82		
1.18	77		
0.6	70		
0.425	67		
0.3	64		
0.212	61		
0.15	57		
0.063	51		

Dry Mass of sample, g	510

Sample Proportions	% dry mass
Very coarse	0
Gravel	18
Sand	31
Fines <0.063mm	51

Grading Analysis		
D100	mm	
D60	mm	0.19
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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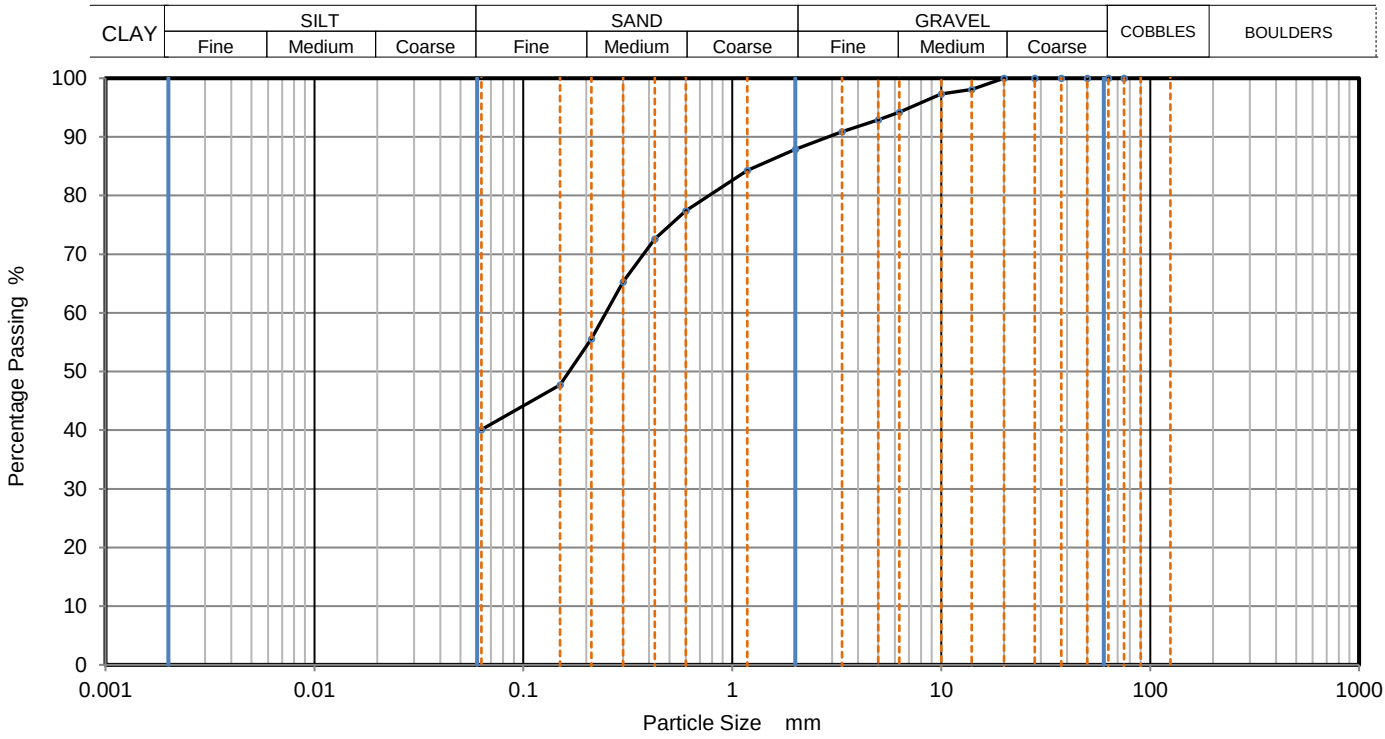
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-A
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Grey slightly gravelly sandy SILT. Sand is medium.			Depth, m	2.70
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202102192



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	97		
6.3	94		
5	93		
3.35	91		
2	88		
1.18	84		
0.6	77		
0.425	73		
0.3	65		
0.212	56		
0.15	48		
0.063	40		

Dry Mass of sample, g	591

Sample Proportions	% dry mass
Very coarse	0
Gravel	12
Sand	48
Fines <0.063mm	40

Grading Analysis		
D100	mm	
D60	mm	0.248
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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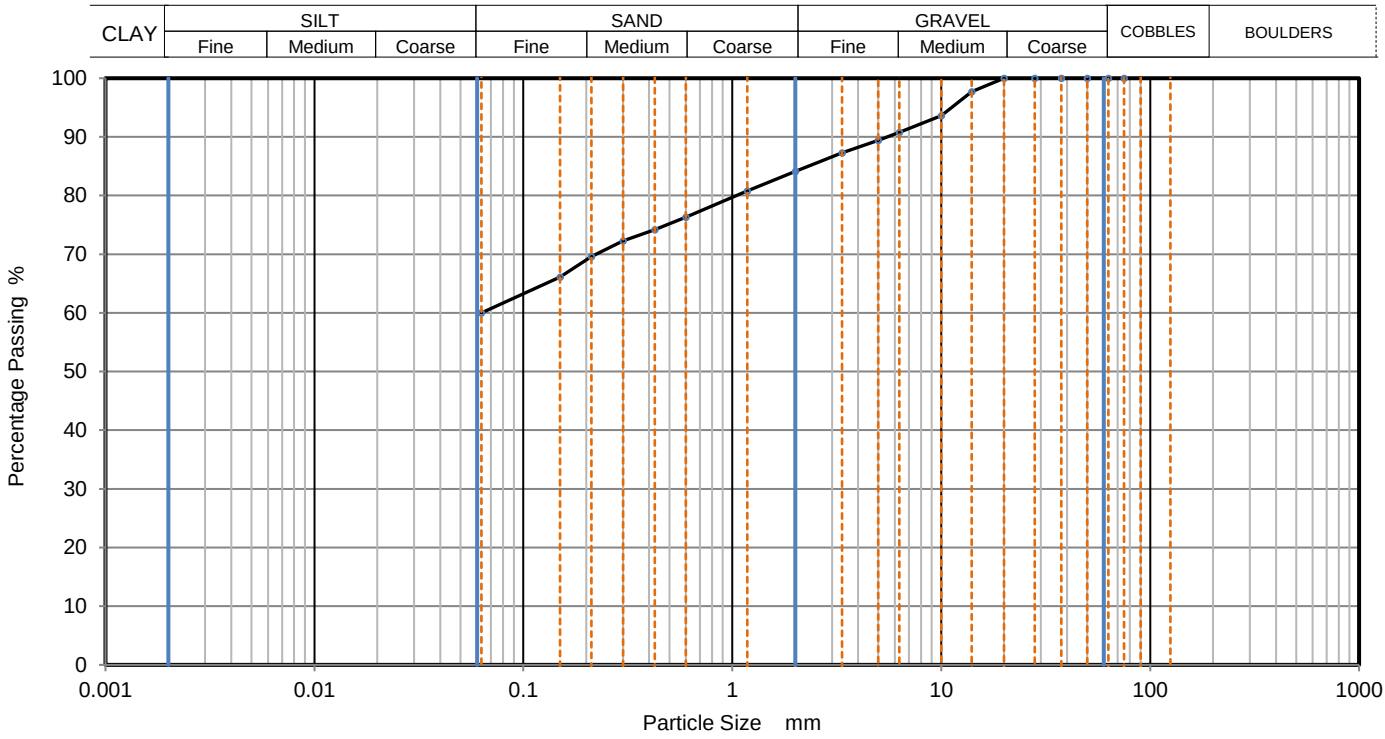
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-B
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey-brown gravelly very sandy SILT.			Depth, m	2.40
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202102196



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	94		
6.3	91		
5	89		
3.35	87		
2	84		
1.18	81		
0.6	76		
0.425	74		
0.3	72		
0.212	70		
0.15	66		
0.063	60		

Dry Mass of sample, g	317

Sample Proportions	% dry mass
Very coarse	0
Gravel	16
Sand	24
Fines <0.063mm	60

Grading Analysis		
D100	mm	
D60	mm	0.0631
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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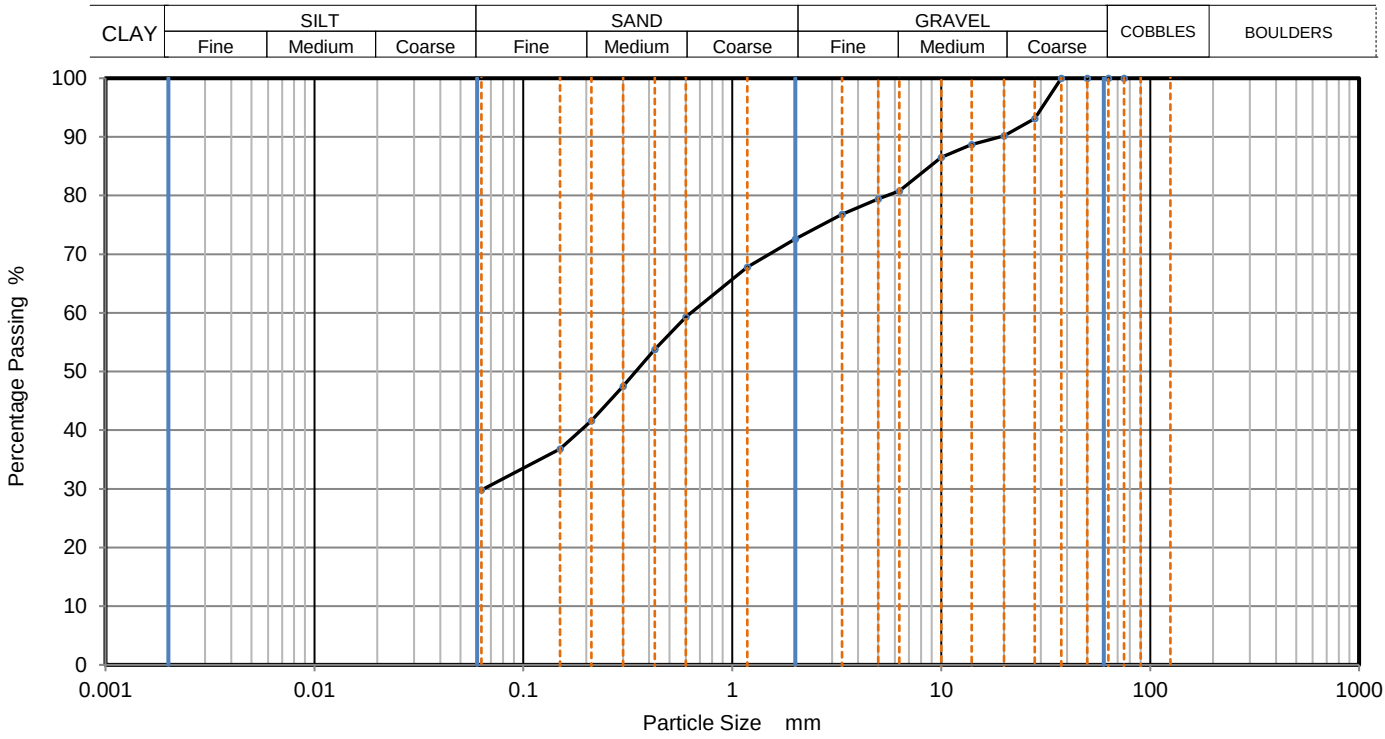
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-C
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Grey very gravelly very silty SAND.			Depth, m	2.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021913



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	93		
20	90		
14	89		
10	87		
6.3	81		
5	79		
3.35	77		
2	73		
1.18	68		
0.6	59		
0.425	54		
0.3	48		
0.212	42		
0.15	37		
0.063	30		

Dry Mass of sample, g	650

Sample Proportions	% dry mass
Very coarse	0
Gravel	27
Sand	43
Fines <0.063mm	30

Grading Analysis		
D100	mm	
D60	mm	0.635
D30	mm	0.0642
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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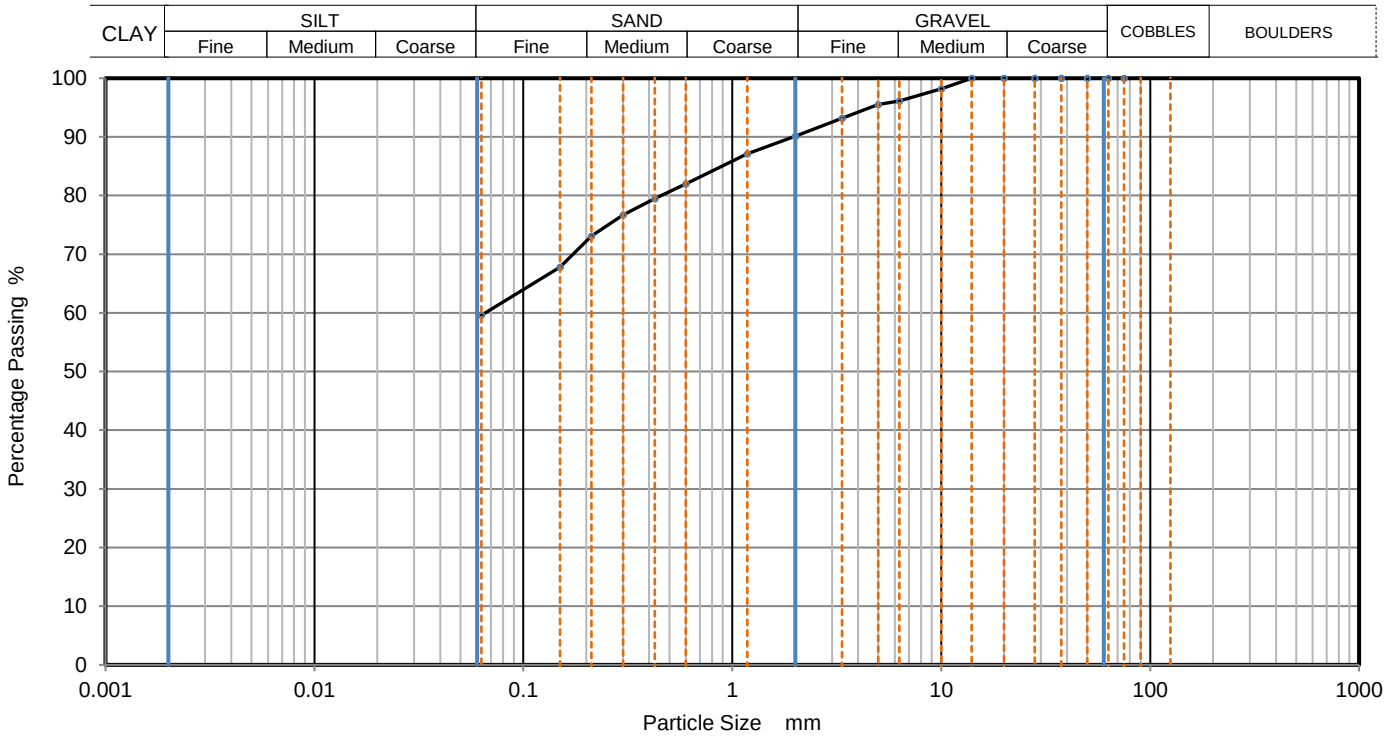
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-E
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark brown slightly gravelly slightly sandy SILT.			Depth, m	2.05
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021918



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	98		
6.3	96		
5	96		
3.35	93		
2	90		
1.18	87		
0.6	82		
0.425	80		
0.3	77		
0.212	73		
0.15	68		
0.063	60		

Dry Mass of sample, g	308

Sample Proportions	% dry mass
Very coarse	0
Gravel	10
Sand	31
Fines <0.063mm	60

Grading Analysis		
D100	mm	
D60	mm	0.0655
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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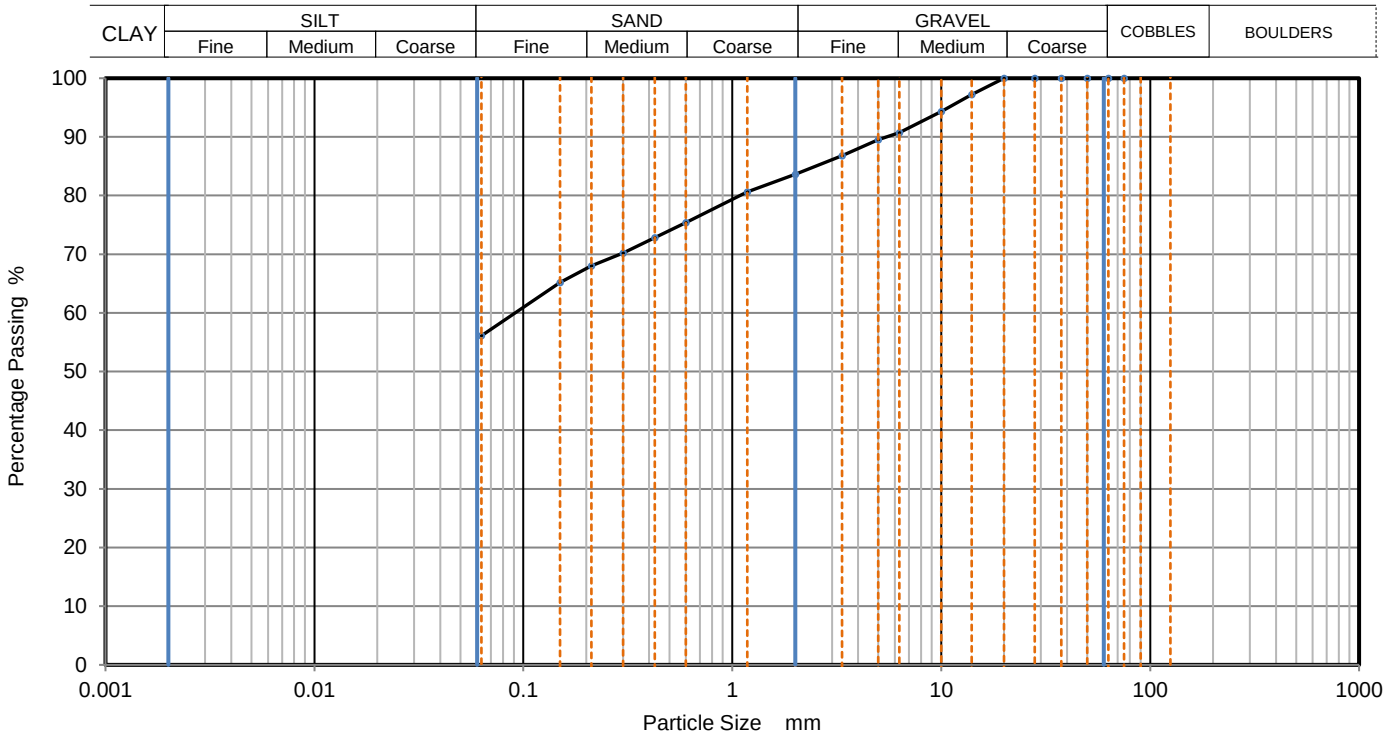
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-F
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark grey slightly gravelly slightly sandy silty CLAY.			Depth, m	2.30
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021923



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	94		
6.3	91		
5	90		
3.35	87		
2	84		
1.18	81		
0.6	75		
0.425	73		
0.3	70		
0.212	68		
0.15	65		
0.063	56		

Dry Mass of sample, g	363

Sample Proportions	% dry mass
Very coarse	0
Gravel	16
Sand	28
Fines <0.063mm	56

Grading Analysis		
D100	mm	
D60	mm	0.0916
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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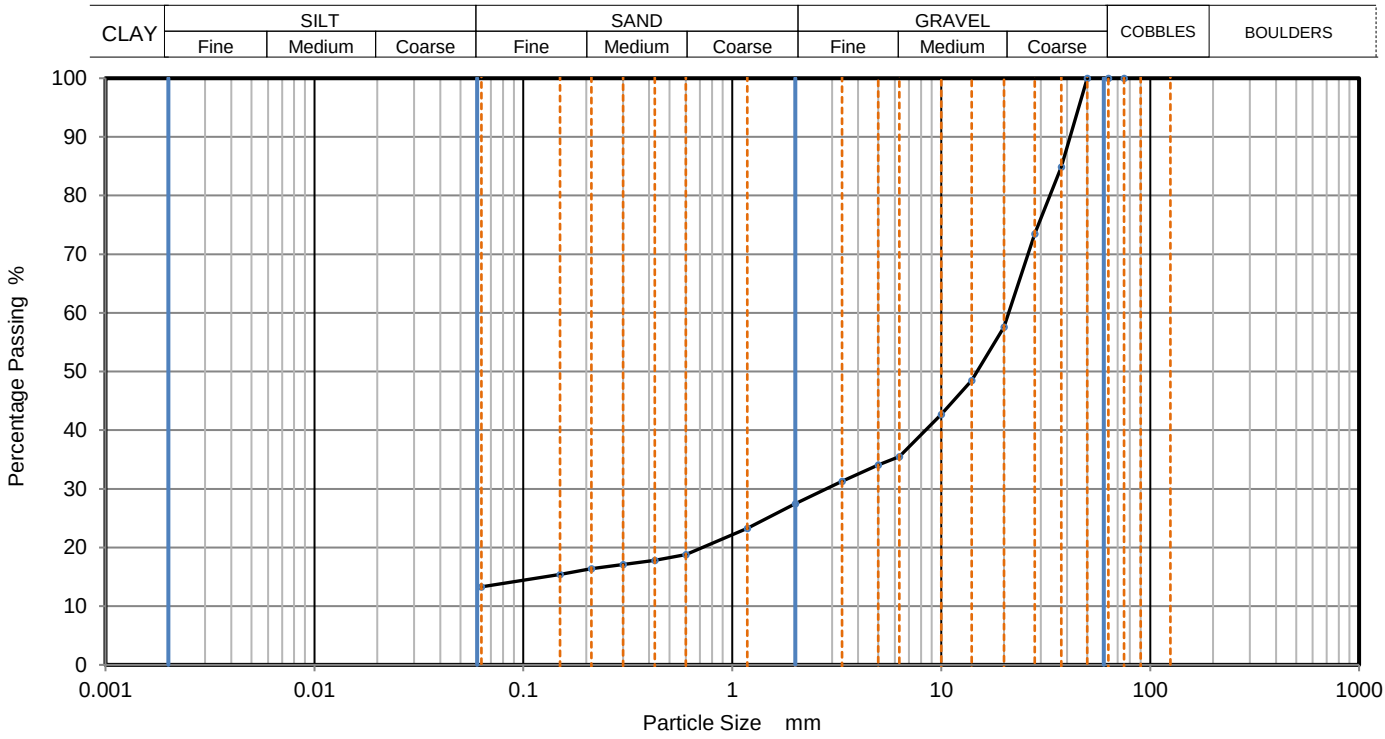
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-G
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Dark grey silty sandy coarse GRAVEL.			Depth, m	3.80
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021929



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	85		
28	74		
20	58		
14	49		
10	43		
6.3	36		
5	34		
3.35	31		
2	28		
1.18	23		
0.6	19		
0.425	18		
0.3	17		
0.212	16		
0.15	15		
0.063	13		

Dry Mass of sample, g	965

Sample Proportions	% dry mass
Very coarse	0
Gravel	73
Sand	14
Fines <0.063mm	13

Grading Analysis		
D100	mm	
D60	mm	21.1
D30	mm	2.81
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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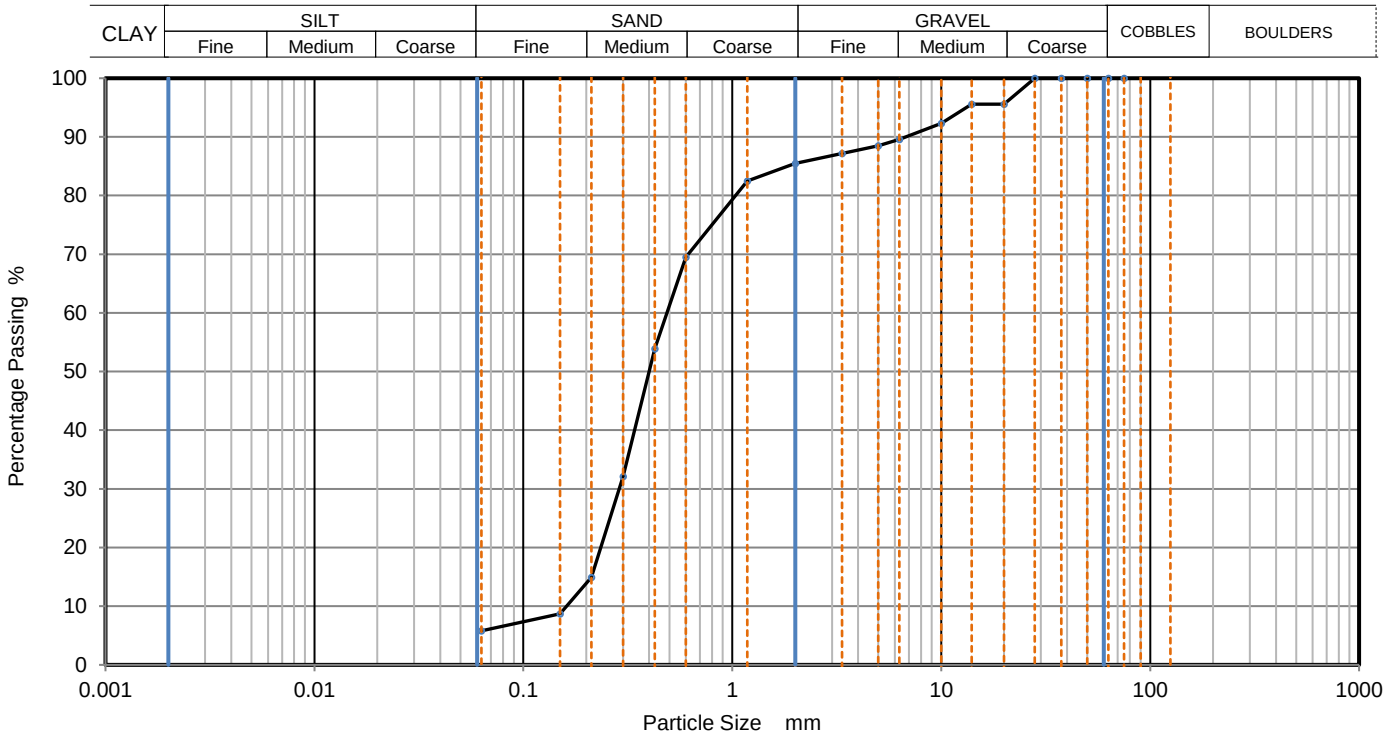
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-H
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Grey silty gravelly medium SAND.			Depth, m	2.30
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021933



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	96		
10	92		
6.3	90		
5	89		
3.35	87		
2	86		
1.18	83		
0.6	70		
0.425	54		
0.3	32		
0.212	15		
0.15	9		
0.063	6		

Dry Mass of sample, g	534

Sample Proportions	% dry mass
Very coarse	0
Gravel	15
Sand	80
Fines <0.063mm	6

Grading Analysis		
D100	mm	
D60	mm	0.486
D30	mm	0.287
D10	mm	0.161
Uniformity Coefficient		3
Curvature Coefficient		1.1

Remarks

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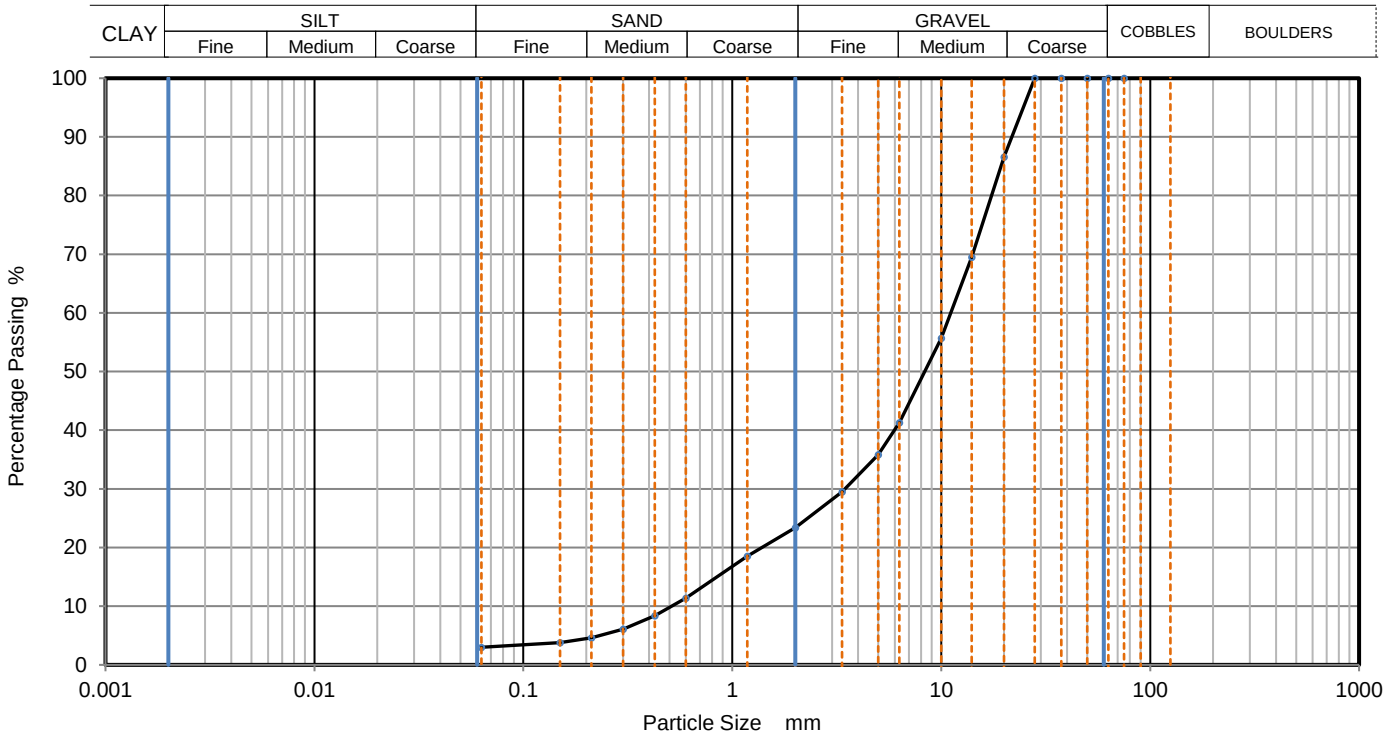
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-I
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Dark grey slightly silty very sandy medium GRAVEL.			Depth, m	3.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021937



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	87		
14	70		
10	56		
6.3	41		
5	36		
3.35	30		
2	23		
1.18	19		
0.6	11		
0.425	8		
0.3	6		
0.212	5		
0.15	4		
0.063	3		

Dry Mass of sample, g	909

Sample Proportions	% dry mass
Very coarse	0
Gravel	77
Sand	21
Fines <0.063mm	3

Grading Analysis		
D100	mm	
D60	mm	11.1
D30	mm	3.46
D10	mm	0.511
Uniformity Coefficient		22
Curvature Coefficient		2.1

Remarks

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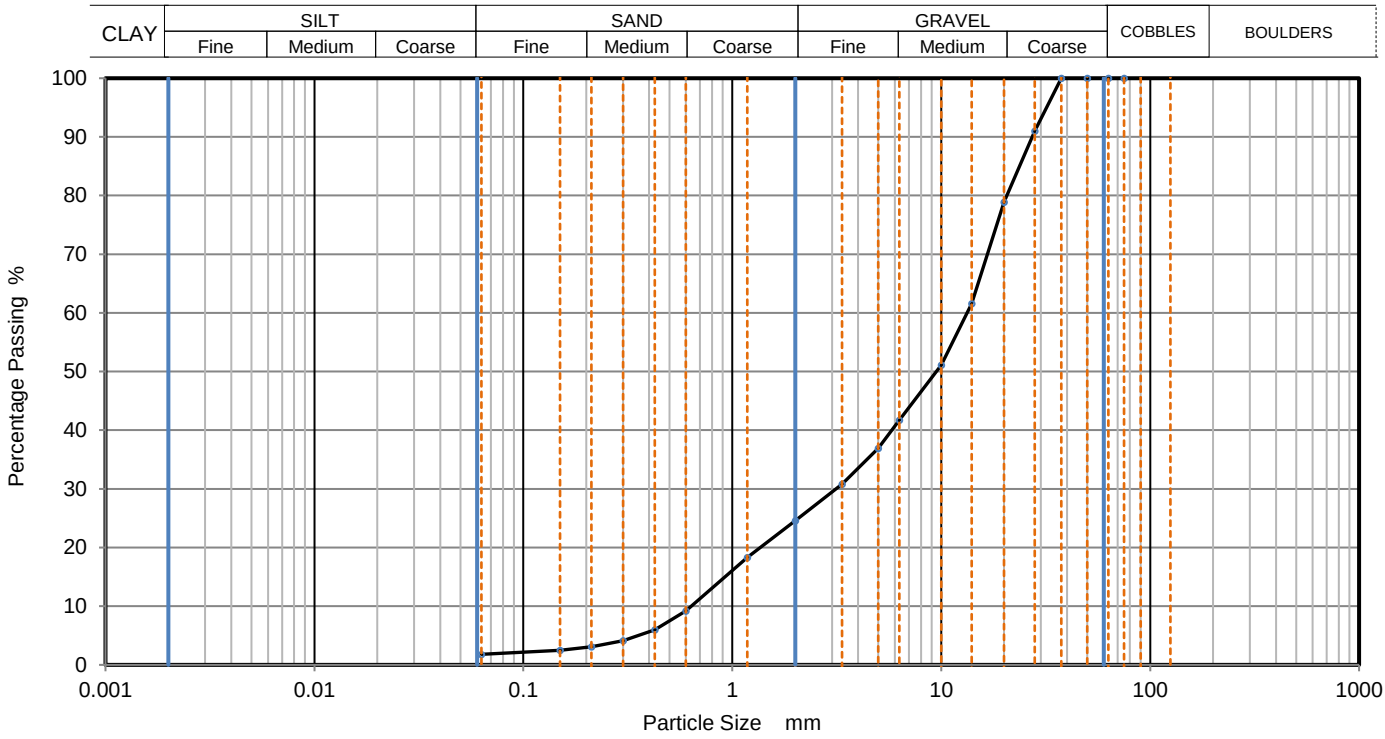
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-J
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Dark gey slightly silty very sandy medium GRAVEL.			Depth, m	2.70
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021940



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	91		
20	79		
14	62		
10	51		
6.3	42		
5	37		
3.35	31		
2	25		
1.18	18		
0.6	9		
0.425	6		
0.3	4		
0.212	3		
0.15	3		
0.063	2		

Dry Mass of sample, g	743

Sample Proportions	% dry mass
Very coarse	0
Gravel	75
Sand	23
Fines <0.063mm	2

Grading Analysis		
D100	mm	
D60	mm	13.3
D30	mm	3.13
D10	mm	0.635
Uniformity Coefficient		21
Curvature Coefficient		1.2

Remarks

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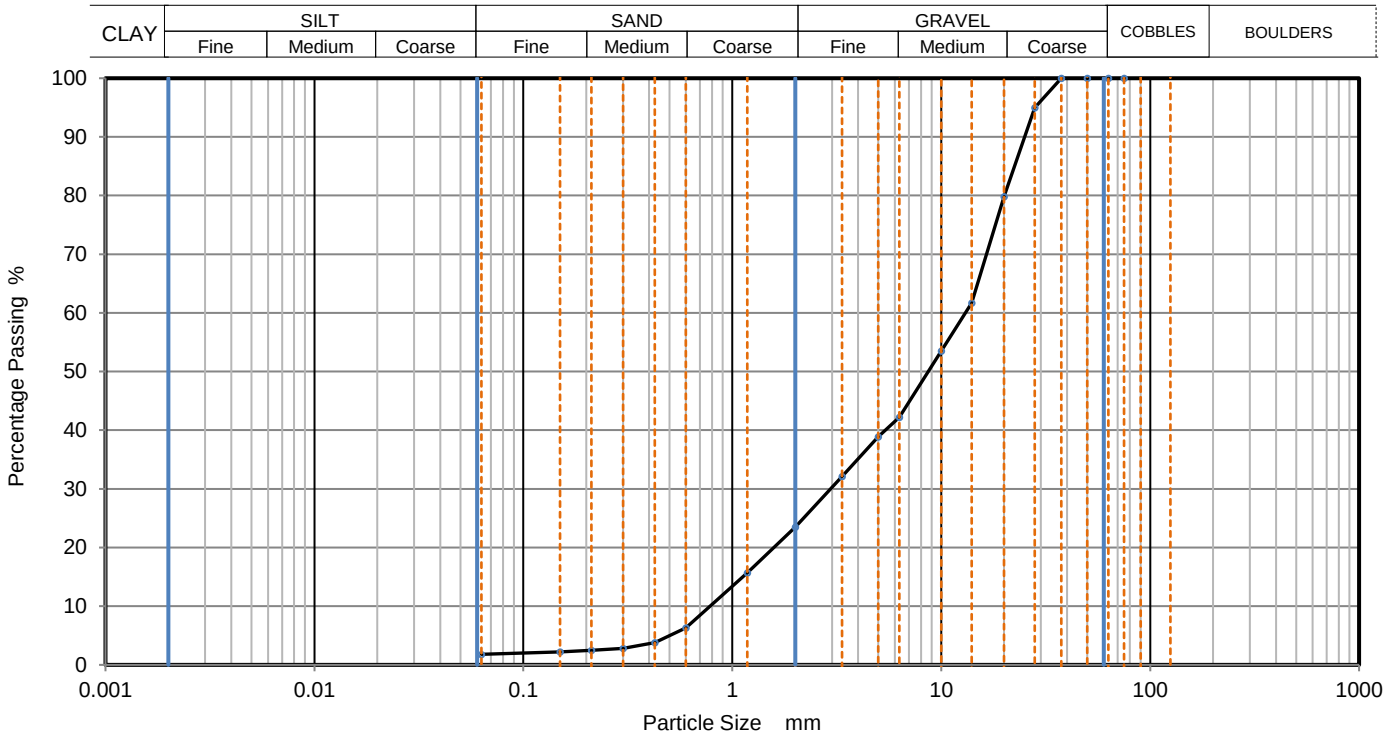
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

PARTICLE SIZE DISTRIBUTION

				Job Ref	**2020MH103**
				Borehole/Pit No.	TP-K
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Grey slightly silty very sandy medium GRAVEL.			Depth, m	3.80
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021944



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	80		
14	62		
10	54		
6.3	42		
5	39		
3.35	32		
2	24		
1.18	16		
0.6	6		
0.425	4		
0.3	3		
0.212	3		
0.15	2		
0.063	2		

Dry Mass of sample, g	826

Sample Proportions	% dry mass
Very coarse	0
Gravel	77
Sand	22
Fines <0.063mm	2

Grading Analysis		
D100	mm	
D60	mm	13
D30	mm	2.96
D10	mm	0.781
Uniformity Coefficient		17
Curvature Coefficient		0.86

Remarks

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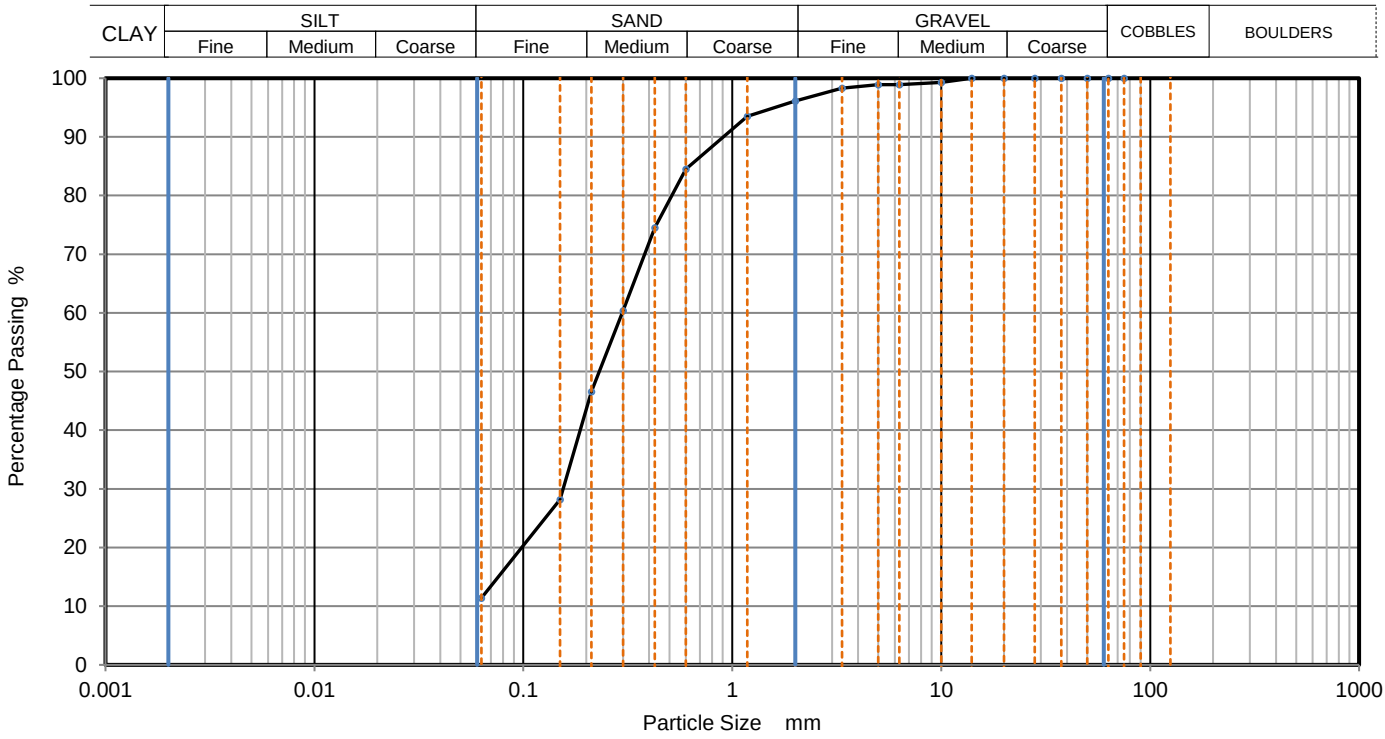
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-L
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Dark grey slightly gravelly silty fine and medium SAND.			Depth, m	2.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021947



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	99		
5	99		
3.35	98		
2	96		
1.18	94		
0.6	85		
0.425	75		
0.3	60		
0.212	47		
0.15	28		
0.063	11		

Dry Mass of sample, g	537

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	85
Fines <0.063mm	11

Grading Analysis		
D100	mm	
D60	mm	0.297
D30	mm	0.155
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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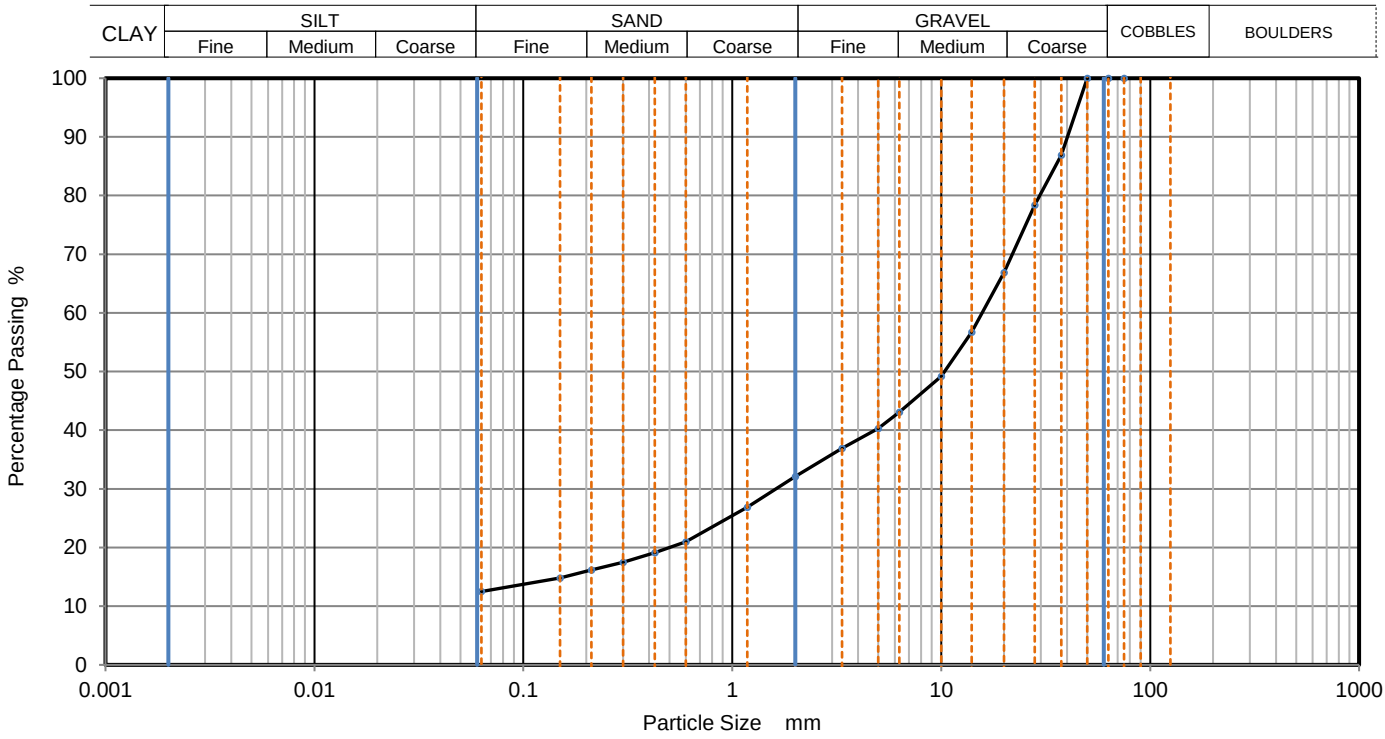
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-M
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Dark grey silty very sandy coarse GRAVEL.			Depth, m	3.10
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021950



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	87		
28	78		
20	67		
14	57		
10	49		
6.3	43		
5	40		
3.35	37		
2	32		
1.18	27		
0.6	21		
0.425	19		
0.3	18		
0.212	16		
0.15	15		
0.063	13		

Dry Mass of sample, g	1177

Sample Proportions	% dry mass
Very coarse	0
Gravel	68
Sand	20
Fines <0.063mm	13

Grading Analysis		
D100	mm	
D60	mm	15.7
D30	mm	1.61
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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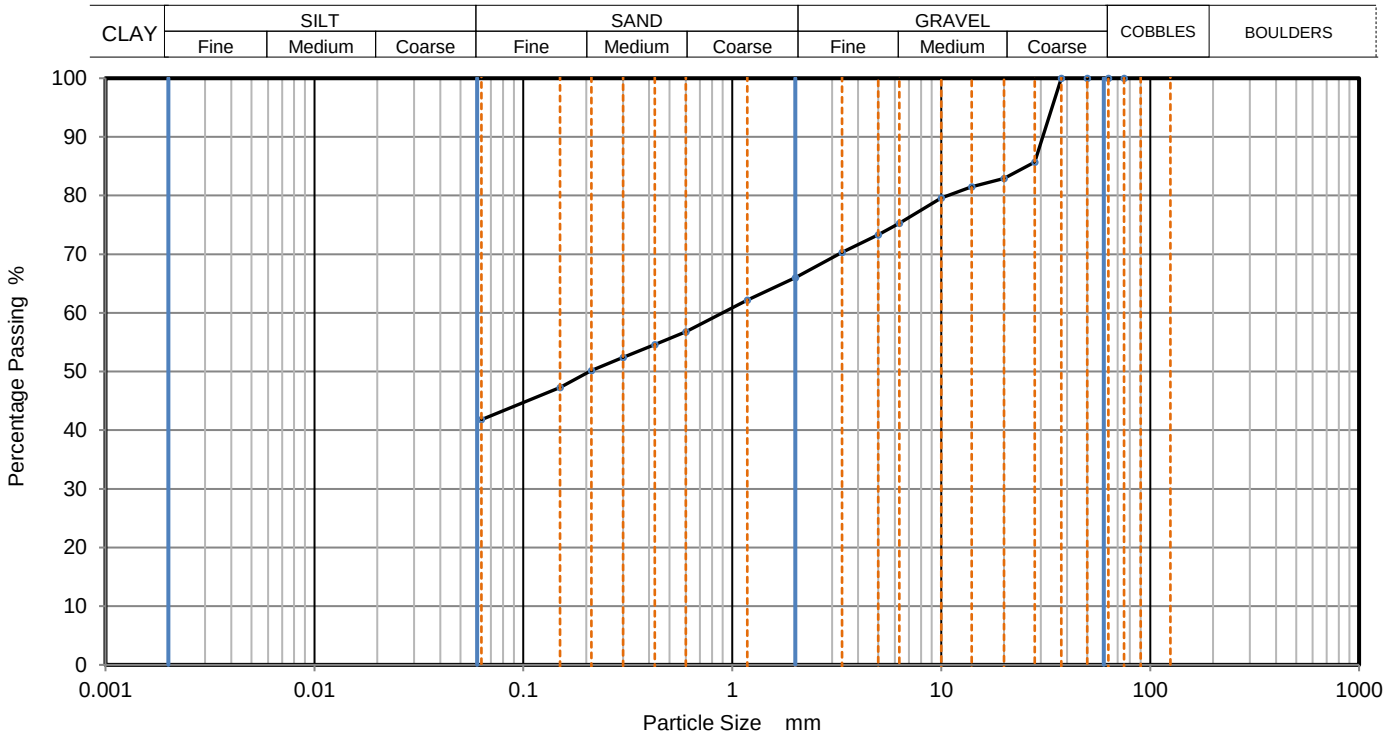
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-N
Site Name	Ballivor Wind Farm			Sample No.	5
Soil Description	Grey slightly sandy gravelly SILT.			Depth, m	3.60
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021956



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	86		
20	83		
14	82		
10	80		
6.3	75		
5	73		
3.35	70		
2	66		
1.18	62		
0.6	57		
0.425	55		
0.3	52		
0.212	50		
0.15	47		
0.063	42		

Dry Mass of sample, g	698

Sample Proportions	% dry mass
Very coarse	0
Gravel	34
Sand	24
Fines <0.063mm	42

Grading Analysis		
D100	mm	
D60	mm	0.899
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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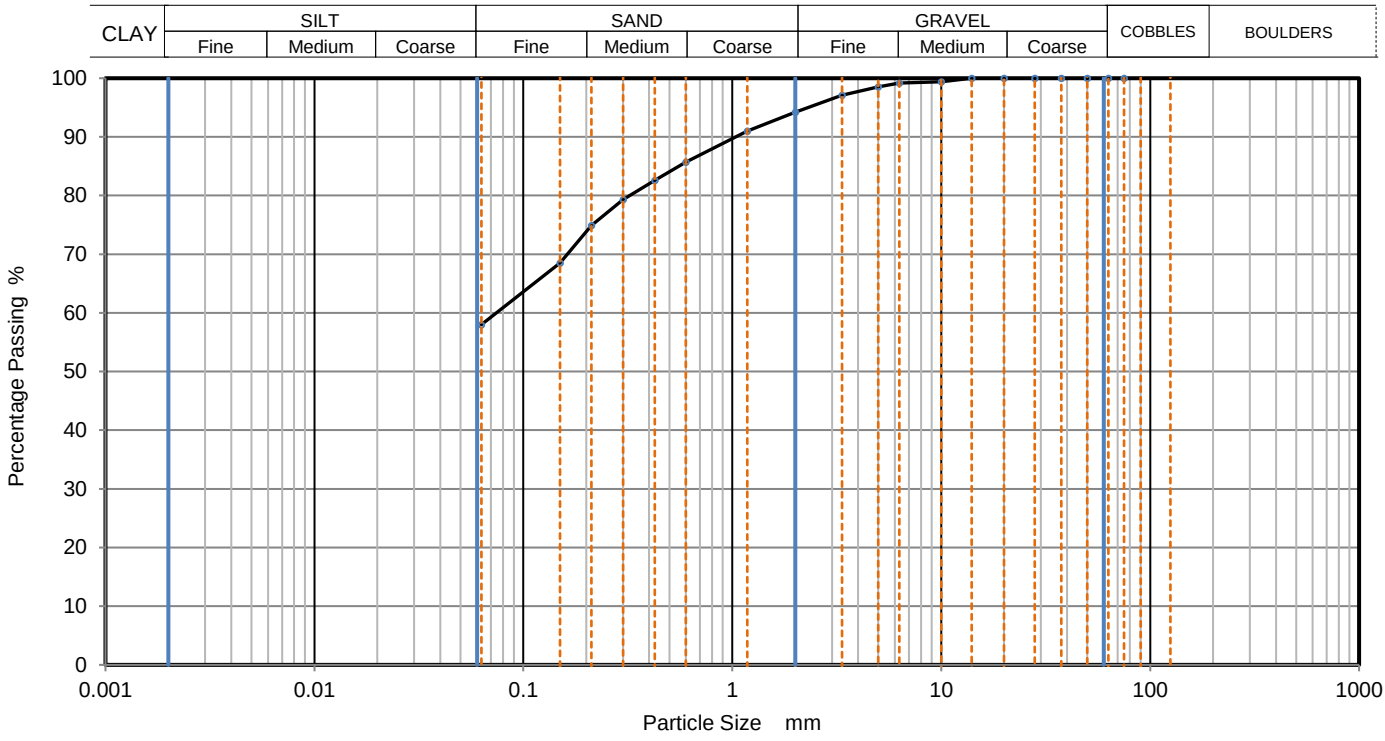
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-O
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Dark brown gravelly very sandy SILT.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021959



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	99		
5	99		
3.35	97		
2	94		
1.18	91		
0.6	86		
0.425	83		
0.3	79		
0.212	75		
0.15	69		
0.063	58		

Dry Mass of sample, g	458

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	36
Fines <0.063mm	58

Grading Analysis		
D100	mm	
D60	mm	0.0742
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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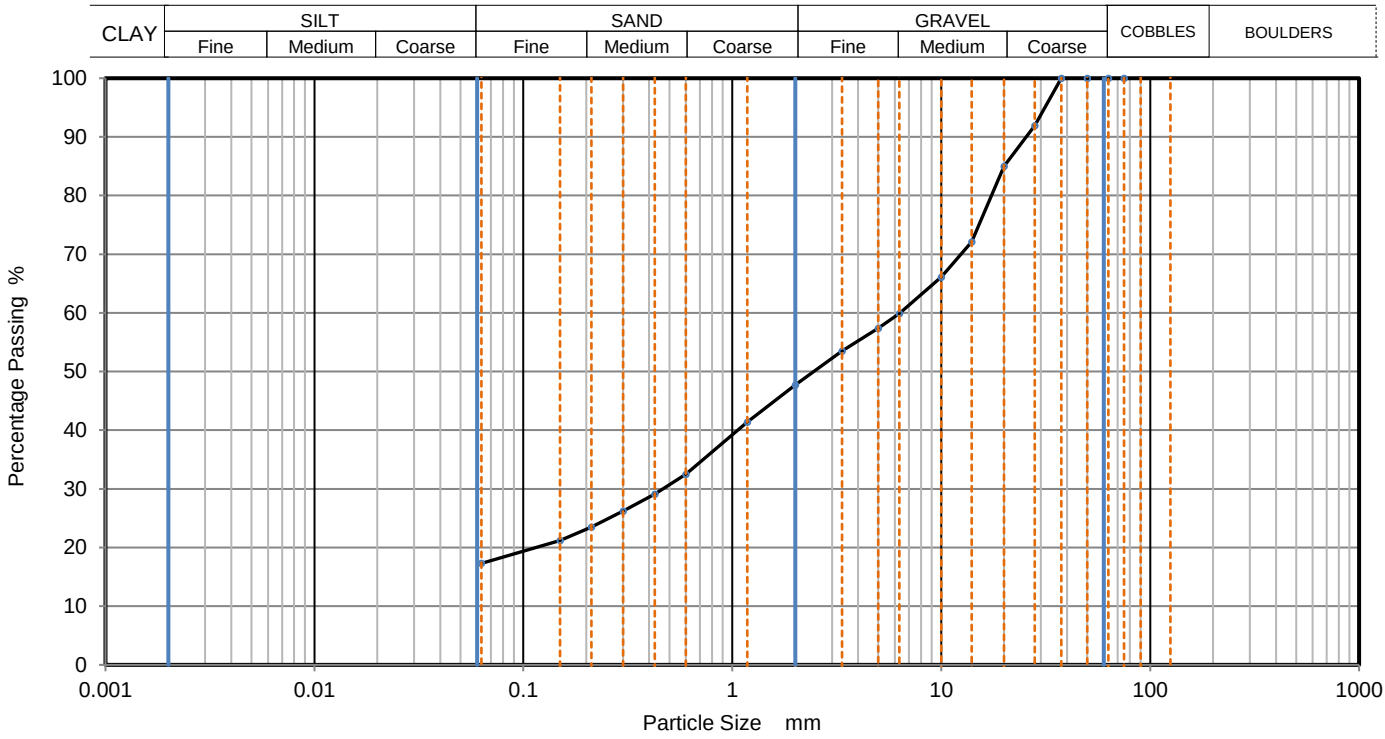
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-S
Site Name	Ballivor Wind Farm			Sample No.	4
Soil Description	Light grey silty very sandy medium GRAVEL.			Depth, m	3.60
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021977



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	92		
20	85		
14	72		
10	66		
6.3	60		
5	57		
3.35	54		
2	48		
1.18	41		
0.6	33		
0.425	29		
0.3	26		
0.212	24		
0.15	21		
0.063	17		

Dry Mass of sample, g	834

Sample Proportions	% dry mass
Very coarse	0
Gravel	52
Sand	31
Fines <0.063mm	17

Grading Analysis		
D100	mm	
D60	mm	6.33
D30	mm	0.467
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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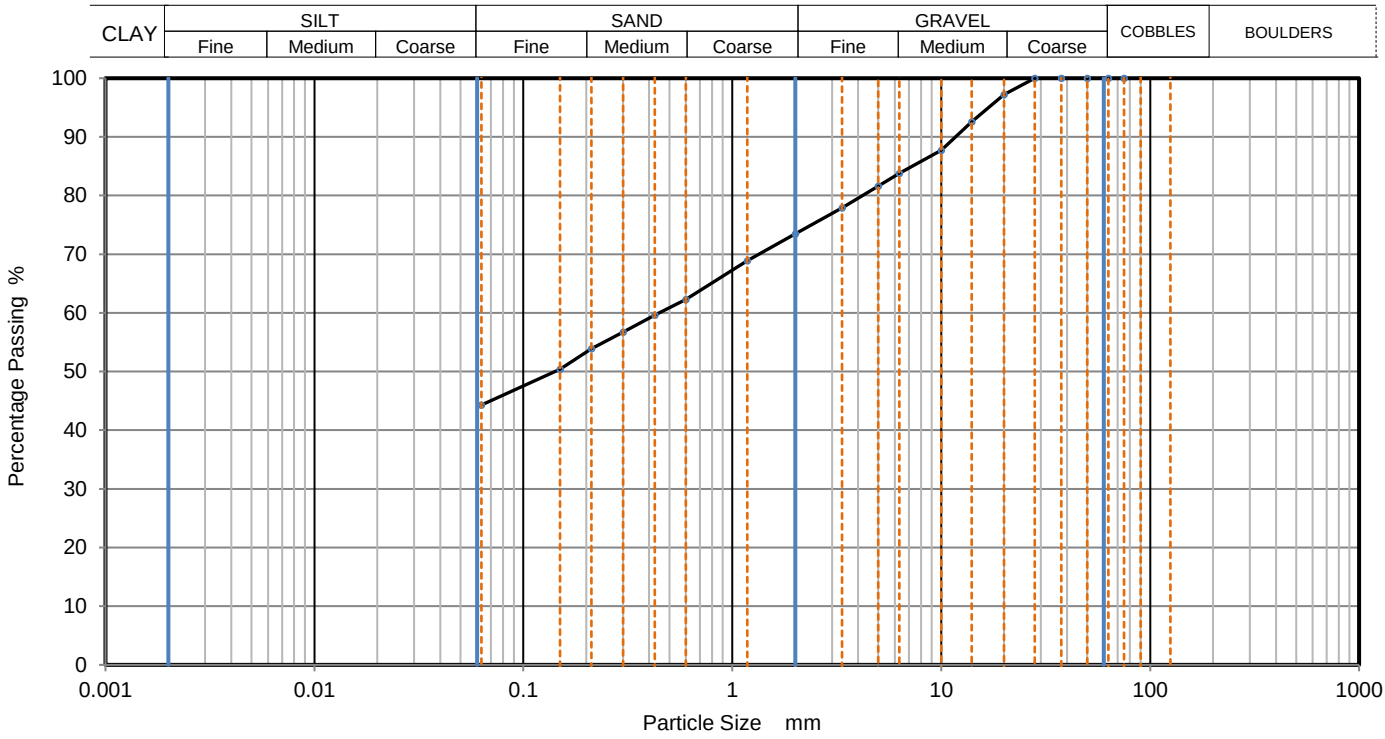
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-T
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Grey slightly sandy gravely SILT.			Depth, m	2.80
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021981



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	97		
14	93		
10	88		
6.3	84		
5	82		
3.35	78		
2	74		
1.18	69		
0.6	62		
0.425	60		
0.3	57		
0.212	54		
0.15	50		
0.063	44		

Dry Mass of sample, g	776

Sample Proportions	% dry mass
Very coarse	0
Gravel	27
Sand	29
Fines <0.063mm	44

Grading Analysis		
D100	mm	
D60	mm	0.447
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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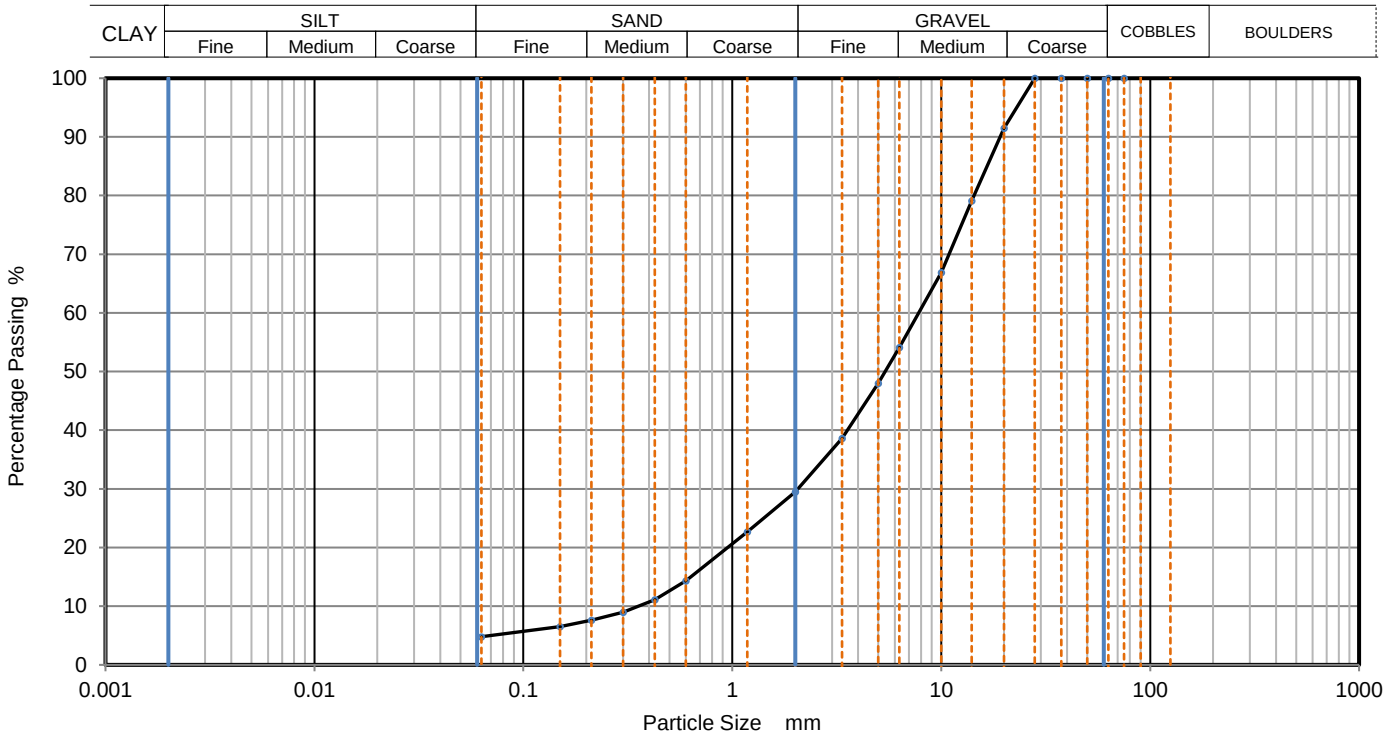
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

PARTICLE SIZE DISTRIBUTION

				Job Ref	**2020MH103**
				Borehole/Pit No.	TP-V
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark grey silty very sasndy medium GRAVEL.			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021988



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	92		
14	79		
10	67		
6.3	54		
5	48		
3.35	39		
2	30		
1.18	23		
0.6	14		
0.425	11		
0.3	9		
0.212	8		
0.15	7		
0.063	5		

Dry Mass of sample, g	649

Sample Proportions	% dry mass
Very coarse	0
Gravel	71
Sand	25
Fines <0.063mm	5

Grading Analysis		
D100	mm	
D60	mm	7.79
D30	mm	2.05
D10	mm	0.353
Uniformity Coefficient		22
Curvature Coefficient		1.5

Remarks

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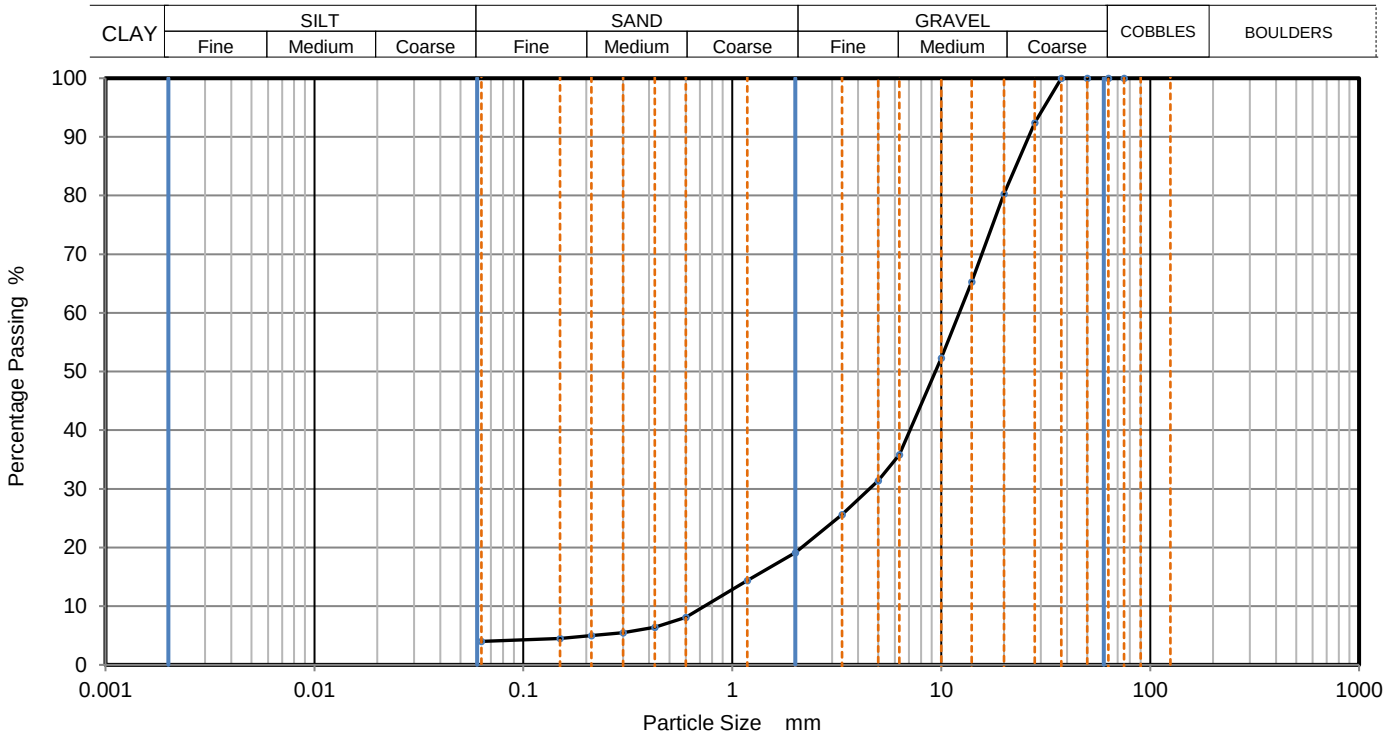
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-W
Site Name	Ballivor Wind Farm			Sample No.	2
Soil Description	Grey slightly silty sandy medium GRAVEL.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021991



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	92		
20	80		
14	65		
10	52		
6.3	36		
5	31		
3.35	26		
2	19		
1.18	14		
0.6	8		
0.425	6		
0.3	6		
0.212	5		
0.15	5		
0.063	4		

Dry Mass of sample, g	831

Sample Proportions	% dry mass
Very coarse	0
Gravel	81
Sand	15
Fines <0.063mm	4

Grading Analysis		
D100	mm	
D60	mm	12.2
D30	mm	4.53
D10	mm	0.735
Uniformity Coefficient		17
Curvature Coefficient		2.3

Remarks

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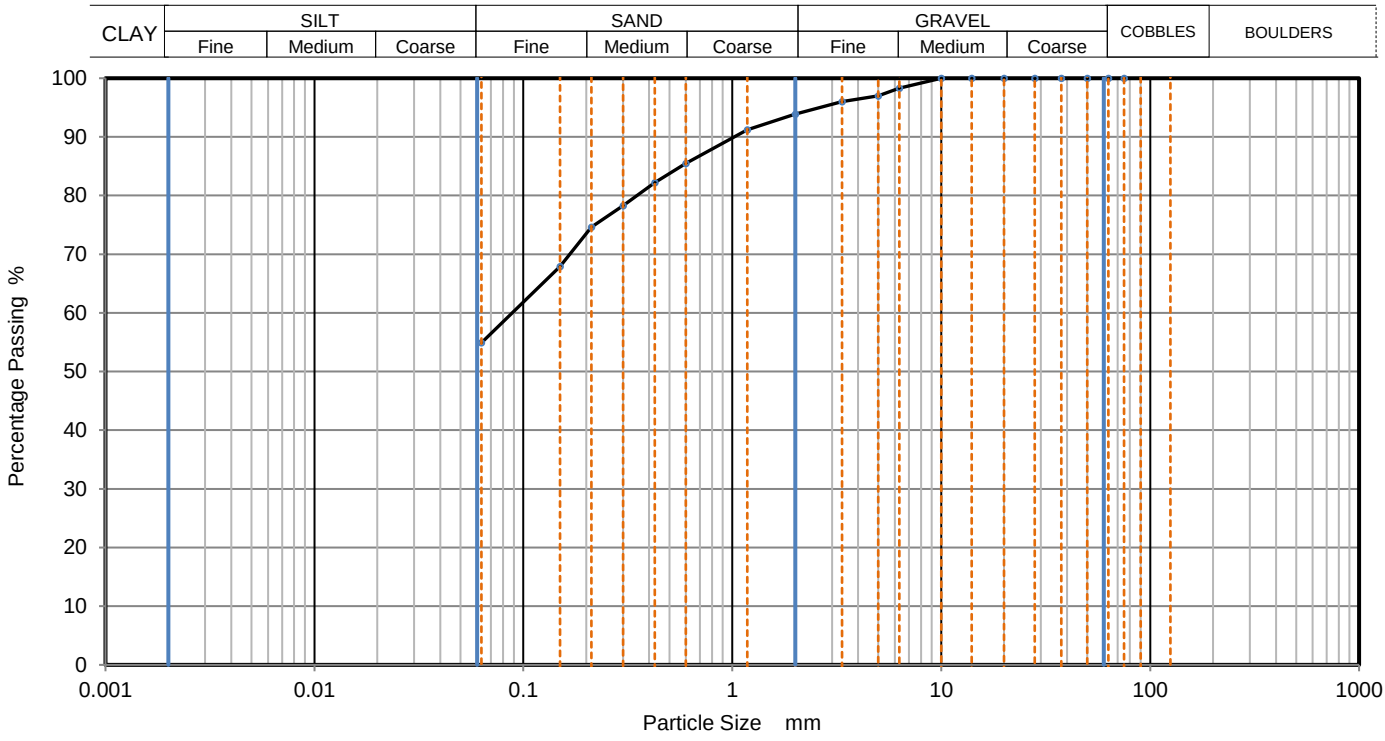
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-X
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Dark grey slightly gravelly sandy SILT. Sand is fine.			Depth, m	4.10
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021021993



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	98		
5	97		
3.35	96		
2	94		
1.18	91		
0.6	86		
0.425	82		
0.3	78		
0.212	75		
0.15	68		
0.063	55		

Dry Mass of sample, g	404

Sample Proportions	% dry mass
Very coarse	0
Gravel	6
Sand	39
Fines <0.063mm	55

Grading Analysis		
D100	mm	
D60	mm	0.0885
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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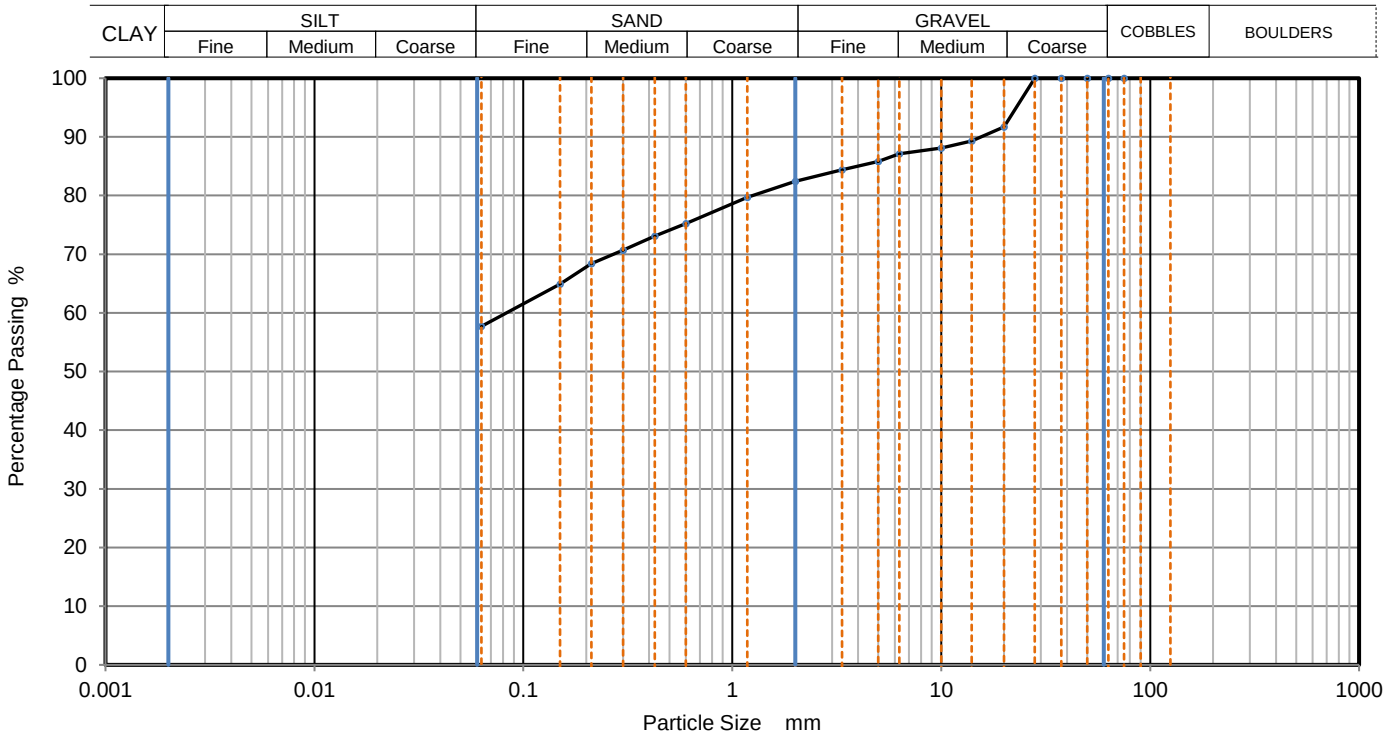
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020MH103**
				Borehole/Pit No.	TP-Z
Site Name	Ballivor Wind Farm			Sample No.	3
Soil Description	Grey slightly gravelly slightly sandy SILT.			Depth, m	1.90
Specimen Reference		Specimen Depth	m	Sample Type	D
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL120210219100



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	92		
14	89		
10	88		
6.3	87		
5	86		
3.35	84		
2	82		
1.18	80		
0.6	75		
0.425	73		
0.3	71		
0.212	68		
0.15	65		
0.063	58		

Dry Mass of sample, g	536

Sample Proportions	% dry mass
Very coarse	0
Gravel	18
Sand	25
Fines <0.063mm	58

Grading Analysis		
D100	mm	
D60	mm	0.0834
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IDL

Moisture Condition Value at Natural Moisture Content
Summary of Results

Project No.: 2020MH103

Project Name: Ballivor Wind Farm

Hole No.	Sample				Soil Description	Retained on 20mm sieve %	Moisture Content <20mm %	Moisture Condition Value	Method of Interpretation	Remarks
	Ref	Top	Base	Type						
TP-08	4	3.60	3.80	B	Grey slightly gravelly slightly sandy SILT.	8	13.8	8.8	Steepest straight line	
TP-12	1	1.80	2.00	B	Dark grey slightly sandy SILT.	0	71.4	10.5	Steepest straight line	
TP-24	1	2.10	2.30	B	Dark grey slightly sandy gravelly SILT.	17	18.3	9.3	Steepest straight line	

Key

Test performed in accordance with BS1377:Part4:1990, clause 5.4 unless annotated otherwise

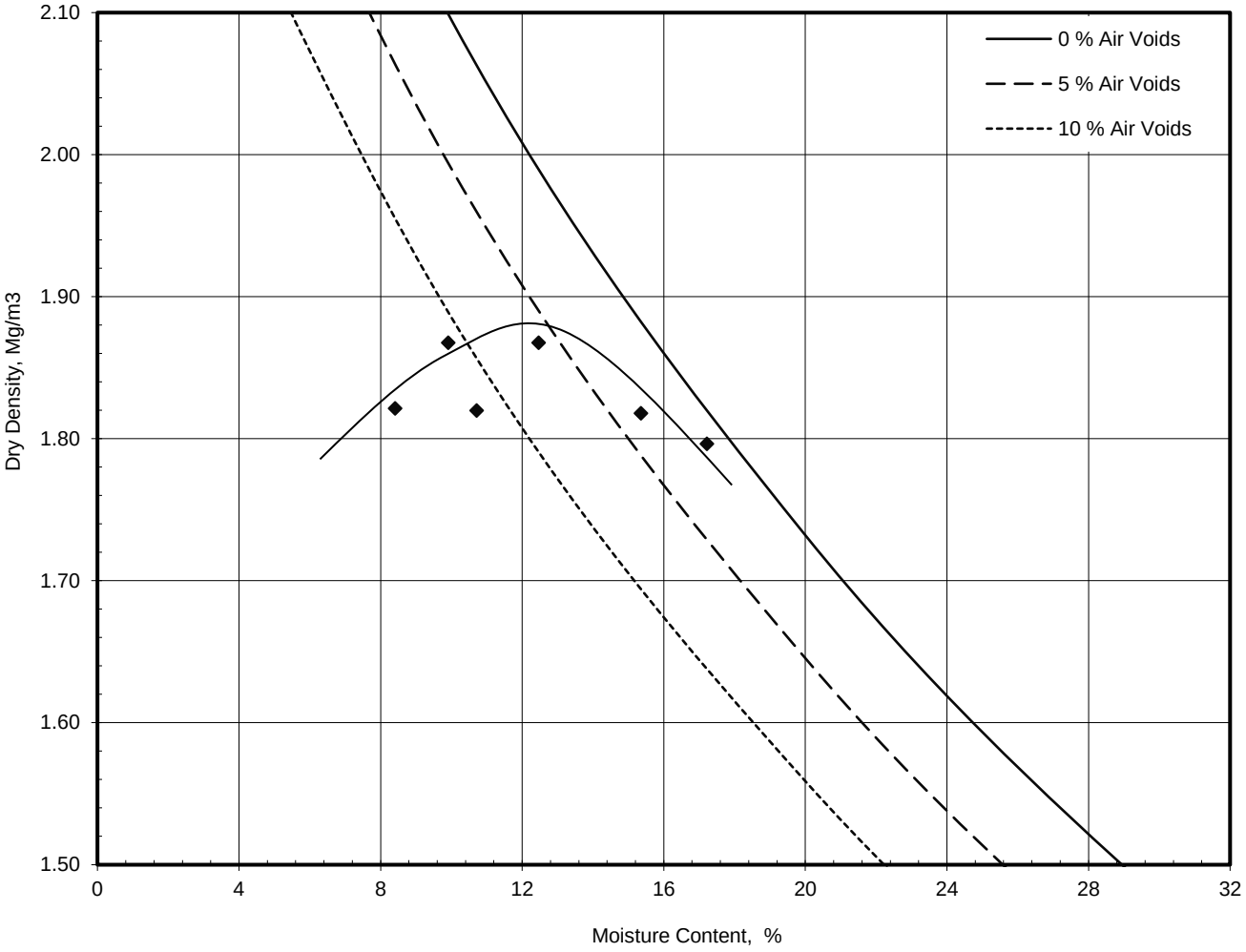
Date Printed: 23/04/2021

Approved By: DCD

Table

sheet

	Dry Density / Moisture Content Relationship Light Compaction			Job Ref	2020MH103
				Borehole / Pit No	BPA-TP01
Site Name	**Ballivor Wind Farm**			Sample No	2
Soil Description	Dark grey slightly gravelly sandy SILT. Sand is fine.			Depth	4.00 m
Specimen Ref.		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.4, 2.5kg rammer			Keylab ID	IDL12021021749
				Compaction Test Reference/No.	



Preparation		Material used was natural
Mould Type		CBR
Samples Used		Composite specimens tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	0
Particle Density -	Mg/m³	2.65

Maximum Dry Density	Mg/m³	**1.87**
Optimum Moisture Content	%	**12**

Operator	Checked	Approved	Remarks	QC Form R4
Administrator	DCD	DCD		Sheet 1 of 1

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

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Irish Drilling Limited
Old Galway Road
Loughrea
Co. Galway

Attention: Dympna Darcy

CERTIFICATE OF ANALYSIS

Date of report Generation:	10 March 2021
Customer:	Irish Drilling Limited
Sample Delivery Group (SDG):	210303-77
Your Reference:	2020MH103
Location:	Ballivor Wind Farm
Report No:	590091

We received 11 samples on Wednesday March 03, 2021 and 11 of these samples were scheduled for analysis which was completed on Wednesday March 10, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	210303-77	**Client Reference:**	2020MH103	**Report Number:**	590091
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
23826868	TP-03	B3	2.00 - 2.20	01/02/2021
23826886	TP-07	B2	3.60 - 3.80	01/02/2021
23826893	TP-11	B1	1.50 - 1.70	01/02/2021
23826899	TP-14	B1	2.20 - 2.40	02/02/2021
23826907	TP-24	B1	2.10 - 2.30	03/02/2021
23826910	TP-26	B1	2.20 - 2.40	03/02/2021
23826916	TP-B	B3	3.70 - 3.90	08/02/2021
23826919	TP-E	B3	3.10 - 3.30	05/02/2021
23826924	TP-N	B3	2.50 - 2.70	08/02/2021
23826873	TP-T	B3	2.80 - 3.00	09/02/2021
23826879	TP-Z	B2	1.90 - 2.10	08/02/2021

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG:	210303-77	**Client Reference:**	2020MH103	**Report Number:**	590091
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Results Legend

X **Test**

N **No Determination Possible**

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type
			23826868	TP-03	B3	2.00 - 2.20	250g Amber Jar (ALE210)	S
			23826886	TP-07	B2	3.60 - 3.80	250g Amber Jar (ALE210)	S
			23826893	TP-11	B1	1.50 - 1.70	250g Amber Jar (ALE210)	S
			23826899	TP-14	B1	2.20 - 2.40	250g Amber Jar (ALE210)	S
			23826907	TP-24	B1	2.10 - 2.30	250g Amber Jar (ALE210)	S
			23826910	TP-26	B1	2.20 - 2.40	250g Amber Jar (ALE210)	S
			23826916	TP-B	B3	3.70 - 3.90	250g Amber Jar (ALE210)	S
			23826919	TP-E	B3	3.10 - 3.30	250g Amber Jar (ALE210)	S
			23826924	TP-N	B3	2.50 - 2.70	250g Amber Jar (ALE210)	S
			23826873	TP-T	B3	2.80 - 3.00	250g Amber Jar (ALE210)	S
			23826879	TP-Z	B2	1.90 - 2.10	250g Amber Jar (ALE210)	S
Anions by Kone (soil)	All	NDPs: 0 Tests: 11	X	X	X	X	X	X	X	X	X	X	X
pH	All	NDPs: 0 Tests: 11	X	X	X	X	X	X	X	X	X	X	X
Sample description	All	NDPs: 0 Tests: 11	X	X	X	X	X	X	X	X	X	X	X
Total Organic Carbon	All	NDPs: 0 Tests: 11	X	X	X	X	X	X	X	X	X	X	X
Total Sulphate	All	NDPs: 0 Tests: 11	X	X	X	X	X	X	X	X	X	X	X
Total Sulphur	All	NDPs: 0 Tests: 11	X	X	X	X	X	X	X	X	X	X	X

CERTIFICATE OF ANALYSIS

SDG:	210303-77	**Client Reference:**	2020MH103	**Report Number:**	590091
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
23826868	TP-03	2.00 - 2.20	Grey	Sandy Silt Loam	Stones	None
23826886	TP-07	3.60 - 3.80	Grey	Silt Loam	Stones	Vegetation
23826893	TP-11	1.50 - 1.70	Dark Brown	Loamy Sand	Stones	Vegetation
23826899	TP-14	2.20 - 2.40	Black	Silty Clay Loam	Stones	Vegetation
23826907	TP-24	2.10 - 2.30	Black	Sandy Clay Loam	Stones	Vegetation
23826910	TP-26	2.20 - 2.40	Black	Sandy Silt Loam	Stones	Vegetation
23826916	TP-B	3.70 - 3.90	Grey	Silty Clay Loam	Stones	Vegetation
23826919	TP-E	3.10 - 3.30	Dark Brown	Clay Loam	Stones	None
23826924	TP-N	2.50 - 2.70	Grey	Sandy Clay Loam	Stones	Vegetation
23826873	TP-T	2.80 - 3.00	Grey	Sandy Clay Loam	Stones	None
23826879	TP-Z	1.90 - 2.10	Dark Brown	Sandy Clay Loam	Stones	Vegetation

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG:	210303-77	**Client Reference:**	2020MH103	**Report Number:**	590091
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	TP-03	TP-07	TP-11	TP-14	TP-24	TP-26
			Depth (m)	2.00 - 2.20	3.60 - 3.80	1.50 - 1.70	2.20 - 2.40	2.10 - 2.30	2.20 - 2.40
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	01/02/2021	01/02/2021	01/02/2021	02/02/2021	03/02/2021	03/02/2021
			Sample Time	.	.	.	.	.	.
			Date Received	03/03/2021	03/03/2021	03/03/2021	03/03/2021	03/03/2021	03/03/2021
			SDG Ref	210303-77	210303-77	210303-77	210303-77	210303-77	210303-77
			Lab Sample No.(s)	23826868	23826886	23826893	23826899	23826907	23826910
			AGS Reference	B3	B2	B1	B1	B1	B1
Moisture Content Ratio (% of as received sample)	%	PM024		31	18	22	23	13	12
Sulphur, Total	<0.02 %	TM132		<0.02 @	0.036 @	0.0214 @	<0.02 @	0.0301 @	0.0351 @
Soil Organic Matter (SOM)	<0.35 %	TM132		1.36 @ #	0.541 @ #	1.23 @ #	0.945 @ #	0.555 @ #	0.579 @ #
pH	1 pH Units	TM133		8.03 @ M	8.4 @ M	7.84 @ M	7.39 @ M	8.69 @ M	8.74 @ M
Sulphate, Total	<48 mg/kg	TM221		157 M	249 M	<48 M	<48 M	358 M	199 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.0185 @ M	0.0137 @ M	0.0076 @ M	0.0096 @ M	0.0115 @ M	0.0193 @ M

Validated

CERTIFICATE OF ANALYSIS

SDG:	210303-77	**Client Reference:**	2020MH103	**Report Number:**	590091
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	TP-B	TP-E	TP-N	TP-T	TP-Z
			Depth (m)	3.70 - 3.90	3.10 - 3.30	2.50 - 2.70	2.80 - 3.00	1.90 - 2.10
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	08/02/2021	05/02/2021	08/02/2021	09/02/2021	08/02/2021
			Sample Time	.	.	.	.	.
			Date Received	03/03/2021	03/03/2021	03/03/2021	03/03/2021	03/03/2021
			SDG Ref	210303-77	210303-77	210303-77	210303-77	210303-77
			Lab Sample No.(s)	23826916	23826919	23826924	23826873	23826879
			AGS Reference	B3	B3	B3	B3	B2
Moisture Content Ratio (% of as received sample)	%	PM024		13	12	8.1	11	24
Sulphur, Total	<0.02 %	TM132		0.0276 @	<0.02 @	0.031 @	0.027 @	0.0242 @
Soil Organic Matter (SOM)	<0.35 %	TM132		0.462 @ #	0.371 @ #	<0.35 @ #	0.464 @ #	1.42 @ #
pH	1 pH Units	TM133		8.66 M	8.48 @ M	8.59 M	8.69 M	7.66 M
Sulphate, Total	<48 mg/kg	TM221		342 M	48.8 M	114 M	282 M	<48 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		<0.004 @ M	0.01 @ M	0.0056 @ M	0.0045 M	0.0078 @ M

CERTIFICATE OF ANALYSIS

SDG:	210303-77	**Client Reference:**	2020MH103	**Report Number:**	590091
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM132	In - house Method	ELTRA CS800 Operators Guide
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer
TM243		Mixed Anions In Soils By Kone

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

CERTIFICATE OF ANALYSIS

SDG:	210303-77	**Client Reference:**	2020MH103	**Report Number:**	590091
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	23826868	23826886	23826893	23826899	23826907	23826910	23826916	23826919	23826924	23826873
Customer Sample Ref.	TP-03	TP-07	TP-11	TP-14	TP-24	TP-26	TP-B	TP-E	TP-N	TP-T
AGS Ref.	B3	B2	B1	B1	B1	B1	B3	B3	B3	B3
Depth	2.00 - 2.20	3.60 - 3.80	1.50 - 1.70	2.20 - 2.40	2.10 - 2.30	2.20 - 2.40	3.70 - 3.90	3.10 - 3.30	2.50 - 2.70	2.80 - 3.00
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	08-Mar-2021	08-Mar-2021	10-Mar-2021	08-Mar-2021	08-Mar-2021	08-Mar-2021	08-Mar-2021	10-Mar-2021	10-Mar-2021	08-Mar-2021
pH	04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021	08-Mar-2021	04-Mar-2021	04-Mar-2021
Sample description	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021	03-Mar-2021
Total Organic Carbon	09-Mar-2021	09-Mar-2021	09-Mar-2021	09-Mar-2021	09-Mar-2021	09-Mar-2021	09-Mar-2021	10-Mar-2021	10-Mar-2021	09-Mar-2021
Total Sulphate	10-Mar-2021	09-Mar-2021	10-Mar-2021	09-Mar-2021	10-Mar-2021	09-Mar-2021	10-Mar-2021	10-Mar-2021	10-Mar-2021	10-Mar-2021
Total Sulphur	09-Mar-2021	09-Mar-2021	08-Mar-2021	09-Mar-2021	09-Mar-2021	09-Mar-2021	09-Mar-2021	10-Mar-2021	10-Mar-2021	09-Mar-2021

Lab Sample No(s)	23826879
Customer Sample Ref.	TP-Z
AGS Ref.	B2
Depth	1.90 - 2.10
Type	Soil/Solid (S)
Anions by Kone (soil)	08-Mar-2021
pH	04-Mar-2021
Sample description	03-Mar-2021
Total Organic Carbon	09-Mar-2021
Total Sulphate	10-Mar-2021
Total Sulphur	09-Mar-2021

Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

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Irish Drilling Limited
Old Galway Road
Loughrea
Co. Galway

Attention: Dympna Darcy

CERTIFICATE OF ANALYSIS

Date of report Generation:	23 March 2021
Customer:	Irish Drilling Limited
Sample Delivery Group (SDG):	210316-78
Your Reference:	2020MH103
Location:	Ballivor Wind Farm
Report No:	591774

We received 6 samples on Tuesday March 16, 2021 and 6 of these samples were scheduled for analysis which was completed on Tuesday March 23, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.

Approved By:

Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	210316-78	**Client Reference:**	2020MH103	**Report Number:**	591774
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
23907976	TP-26	B1	2.20 - 2.40	03/02/2021
23907979	TP-B	B3	3.70 - 3.90	08/02/2021
23907995	TP-E	B3	3.10 - 3.30	05/02/2021
23907998	TP-N	B3	2.50 - 2.70	08/02/2021
23908000	TP-T	B3	2.80 - 3.00	09/02/2021
23908005	TP-Z	B2	1.90 - 2.10	08/02/2021

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG:	210316-78	**Client Reference:**	2020MH103	**Report Number:**	591774
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Results Legend

X **Test**

N **No Determination Possible**

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type
			2307976	TP-26	B1	2.20 - 2.40	250g Amber Jar (ALE210)	S
			2307979	TP-B	B3	3.70 - 3.90	250g Amber Jar (ALE210)	S
			2307995	TP-E	B3	3.10 - 3.30	250g Amber Jar (ALE210)	S
			2307998	TP-N	B3	2.50 - 2.70	250g Amber Jar (ALE210)	S
			2308000	TP-T	B3	2.80 - 3.00	250g Amber Jar (ALE210)	S
			2308005	TP-Z	B2	1.90 - 2.10	250g Amber Jar (ALE210)	S
Anions by Kone (soil)	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
pH	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
Sample description	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
Total Organic Carbon	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
Total Sulphate	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
Total Sulphur	All	NDPs: 0 Tests: 6	X	X	X	X	X	X

CERTIFICATE OF ANALYSIS

SDG:	210316-78	**Client Reference:**	2020MH103	**Report Number:**	591774
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	**fine**	0.063mm - 0.1mm	**medium**	0.1mm - 2mm	**coarse**	2mm - 10mm	**very coarse**	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
23907976	TP-26	2.20 - 2.40	Dark Brown	Sandy Clay	Stones	None
23907979	TP-B	3.70 - 3.90	Dark Brown	Sandy Loam	Vegetation	Stones
23907995	TP-E	3.10 - 3.30	Light Brown	Sandy Clay Loam	Stones	None
23907998	TP-N	2.50 - 2.70	Light Brown	Sandy Clay Loam	Stones	None
23908000	TP-T	2.80 - 3.00	Dark Brown	Sandy Loam	Vegetation	Stones
23908005	TP-Z	1.90 - 2.10	Dark Brown	Sandy Loam	Vegetation	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG:	210316-78	**Client Reference:**	2020MH103	**Report Number:**	591774
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	TP-26	TP-B	TP-E	TP-N	TP-T	TP-Z
			Depth (m)	2.20 - 2.40	3.70 - 3.90	3.10 - 3.30	2.50 - 2.70	2.80 - 3.00	1.90 - 2.10
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	03/02/2021	08/02/2021	05/02/2021	08/02/2021	09/02/2021	08/02/2021
			Sample Time	.	.	.	.	.	.
			Date Received	16/03/2021	16/03/2021	16/03/2021	16/03/2021	16/03/2021	16/03/2021
			SDG Ref	210316-78	210316-78	210316-78	210316-78	210316-78	210316-78
			Lab Sample No.(s)	23907976	23907979	23907995	23907998	23908000	23908005
			AGS Reference	B1	B3	B3	B3	B3	B2
Moisture Content Ratio (% of as received sample)	%	PM024		11	13	10	9.8	11	22
Sulphur, Total	<0.02 %	TM132		0.032 @	0.0247 @	0.0249 @	0.0267 @	0.0259 @	<0.02 @
Soil Organic Matter (SOM)	<0.35 %	TM132		0.497 @ #	0.352 @ #	<0.35 @ #	<0.35 @ #	0.414 @ #	0.895 @ #
pH	1 pH Units	TM133		8.54 @ M	8.5 @ M	8.58 @ M	8.67 @ M	8.44 @ M	8.08 @ M
Sulphate, Total	<48 mg/kg	TM221		439 M	563 M	392 M	408 M	401 M	111 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.0238 @ M	0.0075 @ M	0.0093 @ M	0.0064 @ M	0.0054 @ M	0.0106 @ M

CERTIFICATE OF ANALYSIS

SDG:	210316-78	**Client Reference:**	2020MH103	**Report Number:**	591774
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM132	In - house Method	ELTRA CS800 Operators Guide
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer
TM243		Mixed Anions In Soils By Kone

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

CERTIFICATE OF ANALYSIS

SDG:	210316-78	**Client Reference:**	2020MH103	**Report Number:**	591774
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	23907976	23907979	23907995	23907998	23908000	23908005
Customer Sample Ref.	TP-26	TP-B	TP-E	TP-N	TP-T	TP-Z
AGS Ref.	B1	B3	B3	B3	B3	B2
Depth	2.20 - 2.40	3.70 - 3.90	3.10 - 3.30	2.50 - 2.70	2.80 - 3.00	1.90 - 2.10
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	22-Mar-2021	22-Mar-2021	22-Mar-2021	22-Mar-2021	22-Mar-2021	22-Mar-2021
pH	19-Mar-2021	19-Mar-2021	19-Mar-2021	19-Mar-2021	19-Mar-2021	19-Mar-2021
Sample description	16-Mar-2021	17-Mar-2021	16-Mar-2021	16-Mar-2021	17-Mar-2021	17-Mar-2021
Total Organic Carbon	23-Mar-2021	23-Mar-2021	23-Mar-2021	23-Mar-2021	23-Mar-2021	23-Mar-2021
Total Sulphate	23-Mar-2021	23-Mar-2021	23-Mar-2021	23-Mar-2021	23-Mar-2021	23-Mar-2021
Total Sulphur	23-Mar-2021	22-Mar-2021	22-Mar-2021	22-Mar-2021	22-Mar-2021	22-Mar-2021

Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Irish Drilling Limited
Old Galway Road
Loughrea
Co. Galway

Attention: Dympna Darcy

CERTIFICATE OF ANALYSIS

Date of report Generation:	22 April 2021
Customer:	Irish Drilling Limited
Sample Delivery Group (SDG):	210414-113
Your Reference:	2020MH103
Location:	Ballivor Wind Farm
Report No:	594997

We received 6 samples on Wednesday April 14, 2021 and 6 of these samples were scheduled for analysis which was completed on Wednesday April 21, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	210414-113	**Client Reference:**	2020MH103	**Report Number:**	594997
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
24074793	BH-04	D13	4.50 - 4.50	01/02/2021
24074799	BH-05	D16	5.00 - 5.00	02/02/2021
24074803	BH-08	D16	5.50 - 5.50	10/02/2021
24074809	BH-09	D11	3.50 - 3.50	04/02/2021
24074812	BH-11	D8	2.50 - 2.50	08/02/2021
24074814	BPA-BH03A	D2	1.00 - 1.00	15/02/2021

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG:	210414-113	**Client Reference:**	2020MH103	**Report Number:**	594997
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Results Legend

X **Test**

N **No Determination Possible**

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	**Customer Sample Reference**	**AGS Reference**	**Depth (m)**	**Container**	**Sample Type**
			24074793	BH-04	D13	4.50 - 4.50	250g Amber Jar (ALE210)	S
			24074799	BH-05	D16	5.00 - 5.00	250g Amber Jar (ALE210)	S
			24074803	BH-08	D16	5.50 - 5.50	250g Amber Jar (ALE210)	S
			24074809	BH-09	D11	3.50 - 3.50	250g Amber Jar (ALE210)	S
			24074812	BH-11	D8	2.50 - 2.50	250g Amber Jar (ALE210)	S
			24074814	BPA-BH03A	D2	1.00 - 1.00	250g Amber Jar (ALE210)	S
Anions by Kone (soil)	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
pH	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
Sample description	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
Total Organic Carbon	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
Total Sulphate	All	NDPs: 0 Tests: 6	X	X	X	X	X	X

CERTIFICATE OF ANALYSIS

SDG:	210414-113	**Client Reference:**	2020MH103	**Report Number:**	594997
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	**fine**	0.063mm - 0.1mm	**medium**	0.1mm - 2mm	**coarse**	2mm - 10mm	**very coarse**	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
24074793	BH-04	4.50 - 4.50	Grey	Loamy Sand	Stones	None
24074799	BH-05	5.00 - 5.00	Grey	Sandy Clay	Stones	None
24074803	BH-08	5.50 - 5.50	Grey	Sandy Clay	Stones	N/A
24074809	BH-09	3.50 - 3.50	Grey	Sandy Clay	Stones	None
24074812	BH-11	2.50 - 2.50	Dark Brown	Sandy Loam	Stones	None
24074814	BPA-BH03A	1.00 - 1.00	Dark Brown	Silt Loam	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG:	210414-113	**Client Reference:**	2020MH103	**Report Number:**	594997
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	BH-04	BH-05	BH-08	BH-09	BH-11	BPA-BH03A
			Depth (m)	4.50 - 4.50	5.00 - 5.00	5.50 - 5.50	3.50 - 3.50	2.50 - 2.50	1.00 - 1.00
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	01/02/2021	02/02/2021	10/02/2021	04/02/2021	08/02/2021	15/02/2021
			Sample Time	.	.	.	.	.	.
			Date Received	14/04/2021	14/04/2021	14/04/2021	14/04/2021	14/04/2021	14/04/2021
			SDG Ref	210414-113	210414-113	210414-113	210414-113	210414-113	210414-113
			Lab Sample No.(s)	24074793	24074799	24074803	24074809	24074812	24074814
			AGS Reference	D13	D16	D16	D11	D8	D2
Moisture Content Ratio (% of as received sample)	%	PM024		24	17	11	10	14	56
Soil Organic Matter (SOM)	<0.35 %	TM132		1.71 @ #	0.878 @ #	0.834 @ #	0.421 @ #	0.615 @ #	17.4 @ #
pH	1 pH Units	TM133		7.75 @ M	8.26 @ M	8.45 @ M	8.44 @ M	8.43 @ M	6.4 @ M
Sulphate, Total	<48 mg/kg	TM221		422 M	418 M	379 M	373 M	425 M	143 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.006 @ M	0.0115 @ M	0.0247 @ M	<0.004 @ M	0.007 @ M	0.0435 @ M

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM132	In - house Method	ELTRA CS800 Operators Guide
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer
TM243		Mixed Anions In Soils By Kone

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

CERTIFICATE OF ANALYSIS

SDG:	210414-113	**Client Reference:**	2020MH103	**Report Number:**	594997
Location:	Ballivor Wind Farm	**Order Number:**	9570	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	24074793	24074799	24074803	24074809	24074812	24074814
Customer Sample Ref.	BH-04	BH-05	BH-08	BH-09	BH-11	BPA-BH03A
AGS Ref.	D13	D16	D16	D11	D8	D2
Depth	4.50 - 4.50	5.00 - 5.00	5.50 - 5.50	3.50 - 3.50	2.50 - 2.50	1.00 - 1.00
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	18-Apr-2021	18-Apr-2021	18-Apr-2021	18-Apr-2021	19-Apr-2021	19-Apr-2021
pH	15-Apr-2021	15-Apr-2021	15-Apr-2021	15-Apr-2021	16-Apr-2021	16-Apr-2021
Sample description	14-Apr-2021	14-Apr-2021	14-Apr-2021	14-Apr-2021	15-Apr-2021	15-Apr-2021
Total Organic Carbon	20-Apr-2021	20-Apr-2021	20-Apr-2021	20-Apr-2021	20-Apr-2021	20-Apr-2021
Total Sulphate	19-Apr-2021	19-Apr-2021	19-Apr-2021	19-Apr-2021	21-Apr-2021	21-Apr-2021

Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix 05
Photographs (Trial Pits)

Figure 1 H:\20MH103_BallivorWF\Tp1...jpg

Figure 3 H:\20MH103_BallivorWF\Tp1.jpg

Figure 2 H:\20MH103_BallivorWF\Tp1..jpg

Figure 4 H:\20MH103_BallivorWF\Tp2...jpg

Figure 5 H:\20MH103_BallivorWF\Tp2..jpg

Figure 7 H:\20MH103_BallivorWF\Tp3...jpg

Figure 6 H:\20MH103_BallivorWF\Tp2.jpg

Figure 8 H:\20MH103_BallivorWF\Tp3..jpg

Figure 9 H:\20MH103_BallivorWF\Tp3.jpg

Figure 11 H:\20MH103_BallivorWF\Tp4..jpg

Figure 10 H:\20MH103_BallivorWF\Tp4...jpg

Figure 12 H:\20MH103_BallivorWF\Tp4.jpg

Figure 13 H:\20MH103_BallivorWF\Tp5...jpg

Figure 15 H:\20MH103_BallivorWF\Tp5.jpg

Figure 14 H:\20MH103_BallivorWF\Tp5..jpg

Figure 16 H:\20MH103_BallivorWF\Tp7...jpg

Figure 17 H:\20MH103_BallivorWF\Tp7..jpg

Figure 19 H:\20MH103_BallivorWF\Tp8...jpg

Figure 18 H:\20MH103_BallivorWF\Tp7.jpg

Figure 20 H:\20MH103_BallivorWF\Tp8..jpg

Figure 21 H:\20MH103_BallivorWF\Tp8.jpg

Figure 23 H:\20MH103_BallivorWF\Tp10..jpg

Figure 22 H:\20MH103_BallivorWF\Tp10...jpg

Figure 24 H:\20MH103_BallivorWF\Tp10.jpg

Figure 25 H:\20MH103_BallivorWF\Tp11...jpg

Figure 27 H:\20MH103_BallivorWF\Tp11.jpg

Figure 26 H:\20MH103_BallivorWF\Tp11..jpg

Figure 28 H:\20MH103_BallivorWF\Tp12...jpg

Figure 29 H:\20MH103_BallivorWF\Tp12..jpg

Figure 30 H:\20MH103_BallivorWF\Tp12.jpg

Figure 31 H:\20MH103_BallivorWF\Tp13...jpg

Figure 32 H:\20MH103_BallivorWF\Tp13..jpg

Figure 33 H:\20MH103_BallivorWF\Tp13.jpg

Figure 35 H:\20MH103_BallivorWF\Tp14..jpg

Figure 34 H:\20MH103_BallivorWF\Tp14...jpg

Figure 36 H:\20MH103_BallivorWF\Tp14.jpg

Figure 37 H:\20MH103_BallivorWF\Tp15...jpg

Figure 39 H:\20MH103_BallivorWF\Tp15.jpg

Figure 38 H:\20MH103_BallivorWF\Tp15..jpg

Figure 40 H:\20MH103_BallivorWF\Tp17...jpg

Figure 41 H:\20MH103_BallivorWF\Tp17..jpg

Figure 43 H:\20MH103_BallivorWF\Tp18...jpg

Figure 42 H:\20MH103_BallivorWF\Tp17.jpg

Figure 44 H:\20MH103_BallivorWF\Tp18..jpg

Figure 45 H:\20MH103_BallivorWF\Tp18.jpg

Figure 46 H:\20MH103_BallivorWF\Tp20...jpg

Figure 47 H:\20MH103_BallivorWF\Tp20..jpg

Figure 48 H:\20MH103_BallivorWF\Tp20.jpg

Figure 49 H:\20MH103_BallivorWF\Tp22...jpg

Figure 51 H:\20MH103_BallivorWF\Tp22.jpg

Figure 50 H:\20MH103_BallivorWF\Tp22..jpg

Figure 52 H:\20MH103_BallivorWF\Tp23...jpg

Figure 53 H:\20MH103_BallivorWF\Tp23..jpg

Figure 54 H:\20MH103_BallivorWF\Tp23.jpg

Figure 55 H:\20MH103_BallivorWF\Tp24...jpg

Figure 56 H:\20MH103_BallivorWF\Tp24..jpg

Figure 57 H:\20MH103_BallivorWF\Tp24.jpg

Figure 58 H:\20MH103_BallivorWF\Tp25...jpg

Figure 59 H:\20MH103_BallivorWF\Tp25..jpg

Figure 60 H:\20MH103_BallivorWF\Tp25.jpg

Figure 61 H:\20MH103_BallivorWF\Tp26...jpg

Figure 63 H:\20MH103_BallivorWF\Tp26.jpg

Figure 62 H:\20MH103_BallivorWF\Tp26..jpg

Figure 64 H:\20MH103_BallivorWF\Tp27...jpg

Figure 65 H:\20MH103_BallivorWF\Tp27..jpg

Figure 67 H:\20MH103_BallivorWF\Tp28...jpg

Figure 66 H:\20MH103_BallivorWF\Tp27.jpg

Figure 68 H:\20MH103_BallivorWF\Tp28..jpg

Figure 69 H:\20MH103_BallivorWF\Tp28.jpg

Figure 71 H:\20MH103_BallivorWF\Tp29..jpg

Figure 70 H:\20MH103_BallivorWF\Tp29...jpg

Figure 72 H:\20MH103_BallivorWF\Tp29.jpg

Figure 73 H:\20MH103_BallivorWF\Bpa-tp1...jpg

Figure 74 H:\20MH103_BallivorWF\Bpa-tp1..jpg

Figure 75 H:\20MH103_BallivorWF\Bpa-tp1.jpg

Figure 76 H:\20MH103_BallivorWF\Bpa-tp2...jpg

Figure 77 H:\20MH103_BallivorWF\Bpa-tp2..jpg

Figure 78 H:\20MH103_BallivorWF\Bpa-tp2.jpg

Figure 79 H:\20MH103_BallivorWF\TpA...jpg

Figure 81 H:\20MH103_BallivorWF\TpA.jpg

Figure 80 H:\20MH103_BallivorWF\TpA..jpg

Figure 82 H:\20MH103_BallivorWF\TpB...jpg

Figure 83 H:\20MH103_BallivorWF\TpB..jpg

Figure 85 H:\20MH103_BallivorWF\TpC...jpg

Figure 84 H:\20MH103_BallivorWF\TpB.jpg

Figure 86 H:\20MH103_BallivorWF\TpC..jpg

Figure 87 H:\20MH103_BallivorWF\Tpc.jpg

Figure 88 H:\20MH103_BallivorWF\TpD...jpg

Figure 89 H:\20MH103_BallivorWF\TpD..jpg

Figure 90 H:\20MH103_BallivorWF\TpD.jpg

Figure 91 H:\20MH103_BallivorWF\TpE...jpg

Figure 93 H:\20MH103_BallivorWF\TpE.jpg

Figure 92 H:\20MH103_BallivorWF\TpE..jpg

Figure 94 H:\20MH103_BallivorWF\TpF...jpg

Figure 95 H:\20MH103_BallivorWF\TpF..jpg

Figure 96 H:\20MH103_BallivorWF\TpF.jpg

Figure 97 H:\20MH103_BallivorWF\TpG...jpg

Figure 98 H:\20MH103_BallivorWF\TpG..jpg

Figure 99 H:\20MH103_BallivorWF\TpG.jpg

Figure 101 H:\20MH103_BallivorWF\TpH..jpg

Figure 100 H:\20MH103_BallivorWF\TpH...jpg

Figure 102 H:\20MH103_BallivorWF\TpH.jpg

Figure 103 H:\20MH103_BallivorWF\TpI...jpg

Figure 105 H:\20MH103_BallivorWF\TpI.jpg

Figure 104 H:\20MH103_BallivorWF\TpI..jpg

Figure 106 H:\20MH103_BallivorWF\TpJ...jpg

Figure 107 H:\20MH103_BallivorWF\TpJ..jpg

Figure 109 H:\20MH103_BallivorWF\TpK...jpg

Figure 108 H:\20MH103_BallivorWF\TpJ.jpg

Figure 110 H:\20MH103_BallivorWF\TpK..jpg

Figure 111 H:\20MH103_BallivorWF\TpK.jpg

Figure 113 H:\20MH103_BallivorWF\TpL..jpg

Figure 112 H:\20MH103_BallivorWF\TpL...jpg

Figure 114 H:\20MH103_BallivorWF\TpL.jpg

Figure 115 H:\20MH103_BallivorWF\TpM...jpg

Figure 117 H:\20MH103_BallivorWF\TpM.jpg

Figure 116 H:\20MH103_BallivorWF\TpM..jpg

Figure 118 H:\20MH103_BallivorWF\TpN...jpg

Figure 119 H:\20MH103_BallivorWF\TpN..jpg

Figure 121 H:\20MH103_BallivorWF\TpO...jpg

Figure 120 H:\20MH103_BallivorWF\TpN.jpg

Figure 122 H:\20MH103_BallivorWF\TpO..jpg

Figure 123 H:\20MH103_BallivorWF\TpO.jpg

Figure 125 H:\20MH103_BallivorWF\TpP..jpg

Figure 124 H:\20MH103_BallivorWF\TpP...jpg

Figure 126 H:\20MH103_BallivorWF\TpP.jpg

Figure 127 H:\20MH103_BallivorWF\TpQ...jpg

Figure 129 H:\20MH103_BallivorWF\TpQ.jpg

Figure 128 H:\20MH103_BallivorWF\TpQ..jpg

Figure 130 H:\20MH103_BallivorWF\TpR...jpg

Figure 131 H:\20MH103_BallivorWF\TpR..jpg

Figure 133 H:\20MH103_BallivorWF\TpS...jpg

Figure 132 H:\20MH103_BallivorWF\TpR.jpg

Figure 134 H:\20MH103_BallivorWF\TpS..jpg

Figure 135 H:\20MH103_BallivorWF\TpS.jpg

Figure 137 H:\20MH103_BallivorWF\TpT..jpg

Figure 136 H:\20MH103_BallivorWF\TpT...jpg

Figure 138 H:\20MH103_BallivorWF\TpT.jpg

Figure 139 H:\20MH103_BallivorWF\TpU...jpg

Figure 141 H:\20MH103_BallivorWF\TpU.jpg

Figure 140 H:\20MH103_BallivorWF\TpU..jpg

Figure 142 H:\20MH103_BallivorWF\TpV...jpg

Figure 143 H:\20MH103_BallivorWF\TpV..jpg

Figure 145 H:\20MH103_BallivorWF\TpW...jpg

Figure 144 H:\20MH103_BallivorWF\TpV.jpg

Figure 146 H:\20MH103_BallivorWF\TpW..jpg

Figure 147 H:\20MH103_BallivorWF\TpW.jpg

Figure 149 H:\20MH103_BallivorWF\TpX..jpg

Figure 148 H:\20MH103_BallivorWF\TpX...jpg

Figure 150 H:\20MH103_BallivorWF\TpX.jpg

Figure 151 H:\20MH103_BallivorWF\TpY...jpg

Figure 153 H:\20MH103_BallivorWF\TpY.jpg

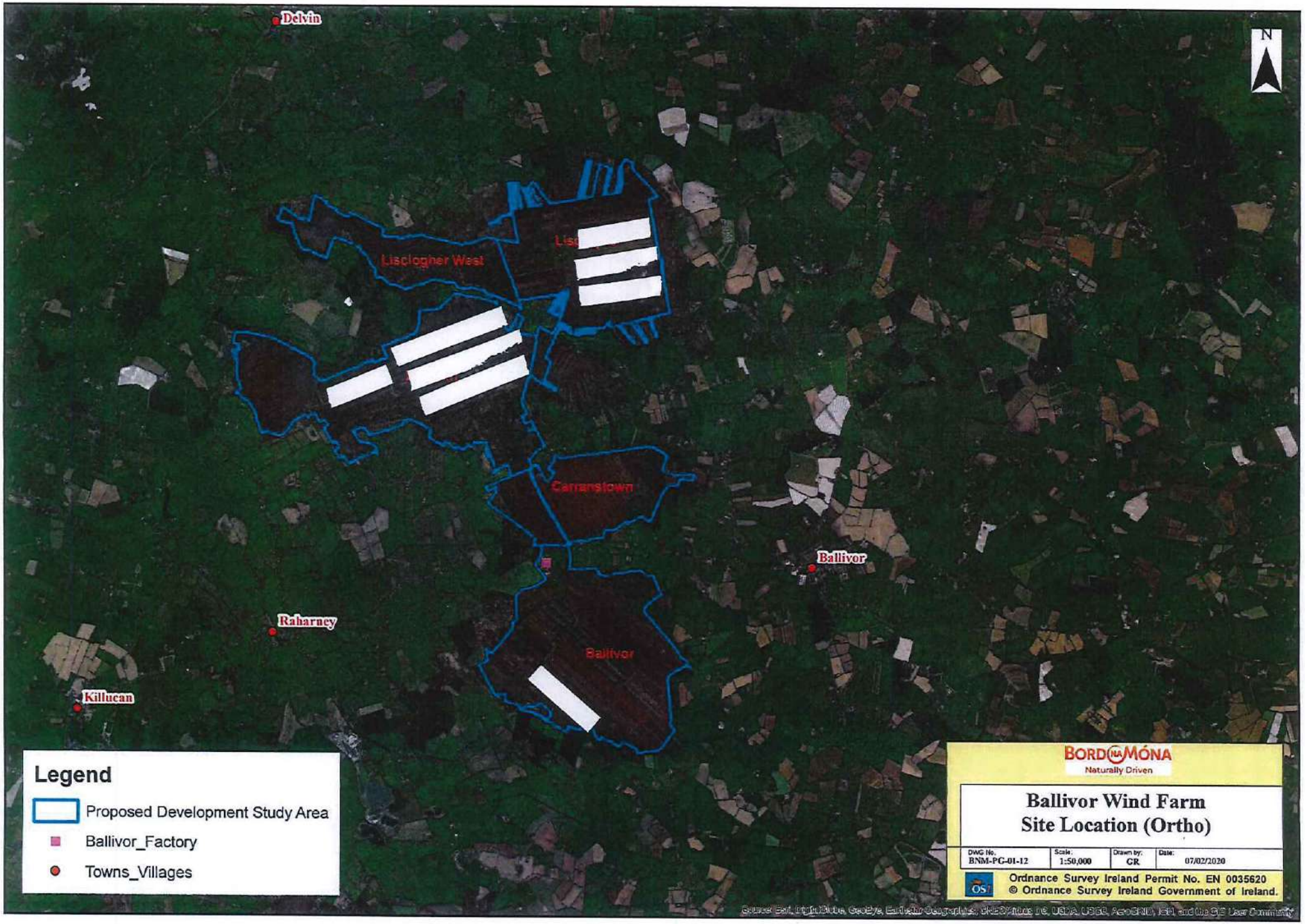
Figure 152 H:\20MH103_BallivorWF\TpY..jpg

Figure 154 H:\20MH103_BallivorWF\TpZ...jpg

Figure 155 H:\20MH103_BallivorWF\TpZ..jpg

Figure 156 H:\20MH103_BallivorWF\TpZ.jpg

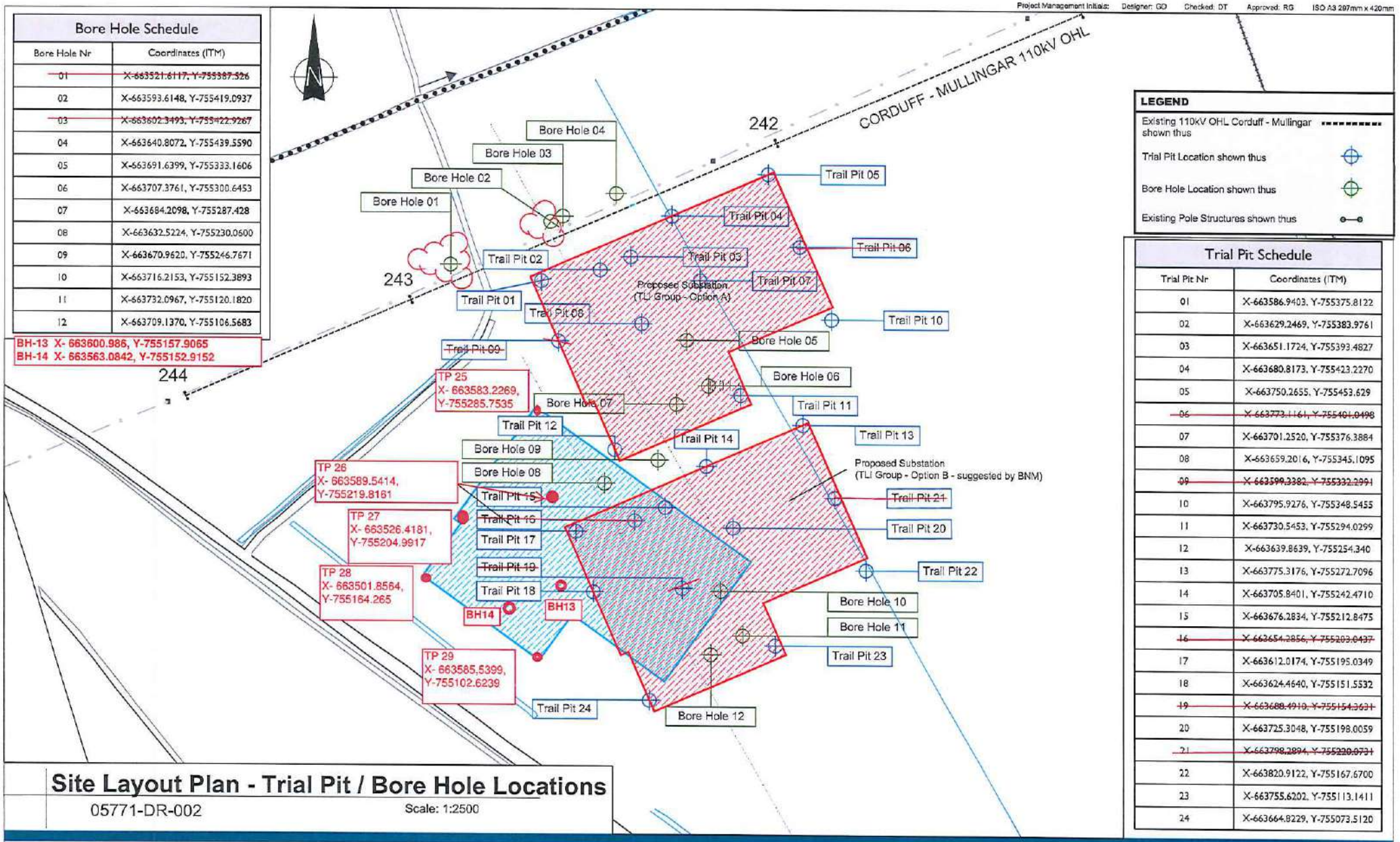
Appendix 06
Site Plans


Delvin
Lisclogher West
Carranstown
Ballivor
Raharney
Killucan
N
Legend
Proposed Development Study Area
Ballivor_Factory
Towns_Villages
BORD NA MÓNA
Naturally Driven
Ballivor Wind Farm
Site Location (Ortho)
DWG No. BNM-PG-01-12
Scale: 1:50,000
Drawn by: GR
Date: 07/02/2020
Ordnance Survey Ireland Permit No. EN 0035620
© Ordnance Survey Ireland Government of Ireland.

Project Management Initials: Designer: GD Checked: DT Approved: RG ISO A3 297mm x 420mm

Bore Hole Schedule	
Bore Hole Nr	Coordinates (ITM)
~~01~~	~~X-663521.6117, Y-755387.526~~
02	X-663593.6148, Y-755419.0937
~~03~~	~~X-663602.3493, Y-755422.9267~~
04	X-663640.8072, Y-755439.5590
05	X-663691.6399, Y-755333.1606
06	X-663707.3761, Y-755300.6453
07	X-663684.2098, Y-755287.428
08	X-663632.5224, Y-755230.0600
09	X-663670.9620, Y-755246.7671
10	X-663716.2153, Y-755152.3893
11	X-663732.0967, Y-755120.1820
12	X-663709.1370, Y-755106.5683

BH-13 X- 663600.986, Y-755157.9065
BH-14 X- 663563.0842, Y-755152.9152



LEGEND

- Existing 110kV OHL Corduff - Mullingar shown thus
- Trial Pit Location shown thus
- Bore Hole Location shown thus
- Existing Pole Structures shown thus

Trial Pit Schedule	
Trial Pit Nr	Coordinates (ITM)
01	X-663586.9403, Y-755375.8122
02	X-663629.2469, Y-755383.9761
03	X-663651.1724, Y-755393.4827
04	X-663680.8173, Y-755423.2270
05	X-663750.2655, Y-755453.629
~~06~~	~~X-663773.1161, Y-755401.0498~~
07	X-663701.2520, Y-755376.3884
08	X-663659.2016, Y-755345.1095
~~09~~	~~X-663599.3382, Y-755332.2991~~
10	X-663795.9276, Y-755348.5455
11	X-663730.5453, Y-755294.0299
12	X-663639.8639, Y-755254.340
13	X-663775.3176, Y-755272.7096
14	X-663705.8401, Y-755242.4710
15	X-663676.2834, Y-755212.8475
~~16~~	~~X-663654.2856, Y-755203.0437~~
17	X-663612.0174, Y-755195.0349
18	X-663624.4640, Y-755151.5532
~~19~~	~~X-663688.4910, Y-755154.3631~~
20	X-663725.3048, Y-755198.0059
~~21~~	~~X-663798.2894, Y-755220.0731~~
22	X-663820.9122, Y-755167.6700
23	X-663755.6202, Y-755113.1411
24	X-663664.8229, Y-755073.5120

Site Layout Plan - Trial Pit / Bore Hole Locations

05771-DR-002 Scale: 1:2500

tli GROUP
Head Office
Beenreigh,
Abbeydorney,
Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

CLIENT: Bord na Móna – Naturally Driven

PROJECT: Ballivor Wind Farm
Grid Connection Loop-In Substation

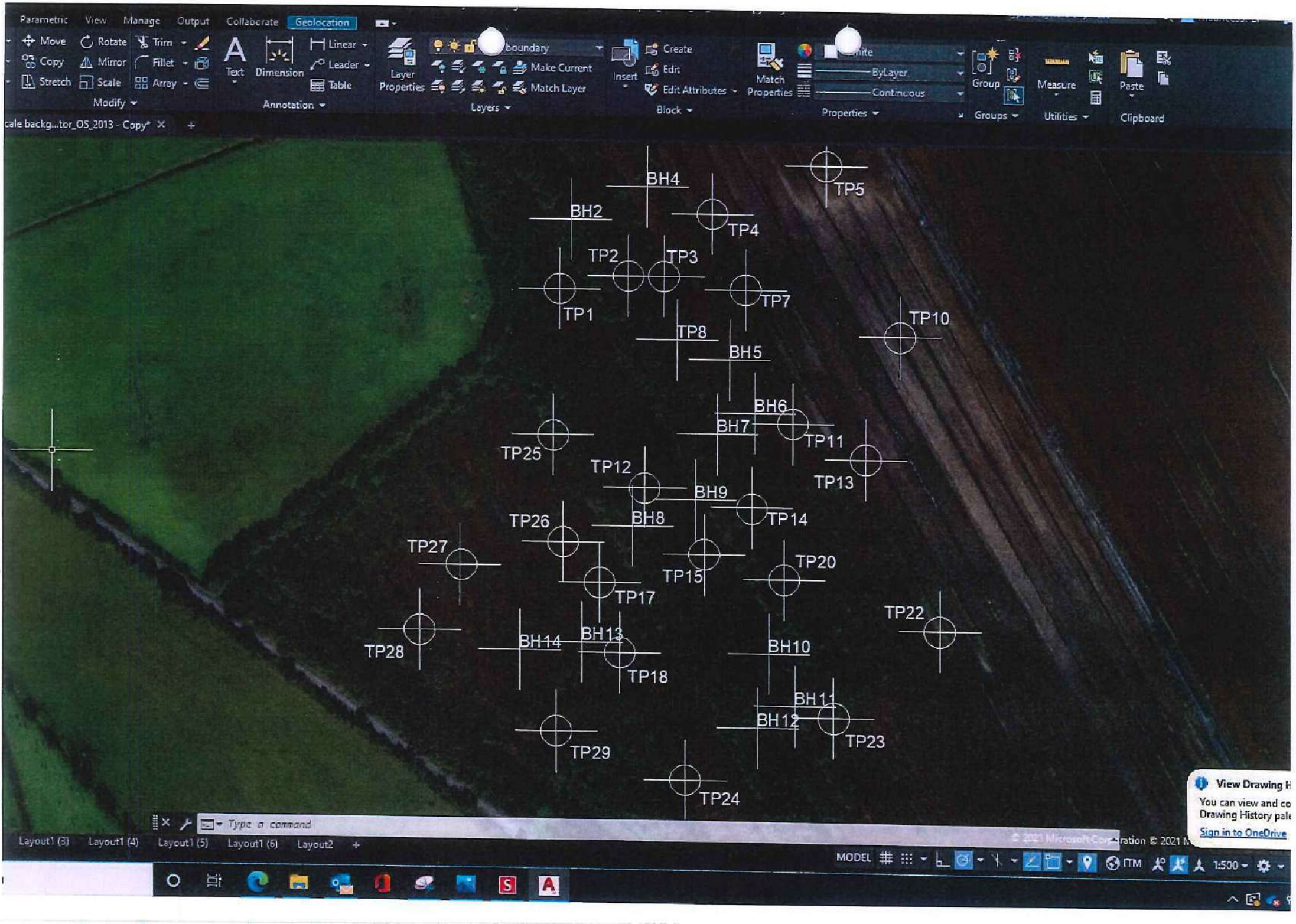
PROJECT NUMBER: 05-771

SHEET NUMBER: 05771-DR-002

SHEET TITLE: Site Layout Plan - Trial Pit / Bore Hole Locations

DRAWING STATUS: For Information

ISSUE/REVISION		
P01	08.01.21	Issued for Information
P00	15.09.20	Issued for Informtion
I/R	DATE	DESCRIPTION


Parametric
View
Manage
Output
Collaborate
Geolocation
Move
Rotate
Trim
Copy
Mirror
Fillet
Stretch
Scale
Array
Modify
Text
Dimension
Linear
Leader
Table
Annotation
Layer Properties
Make Current
Match Layer
Layers
Insert
Create
Edit
Edit Attributes
Block
Match Properties
ByLayer
Continuous
Properties
Group
Groups
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ITM
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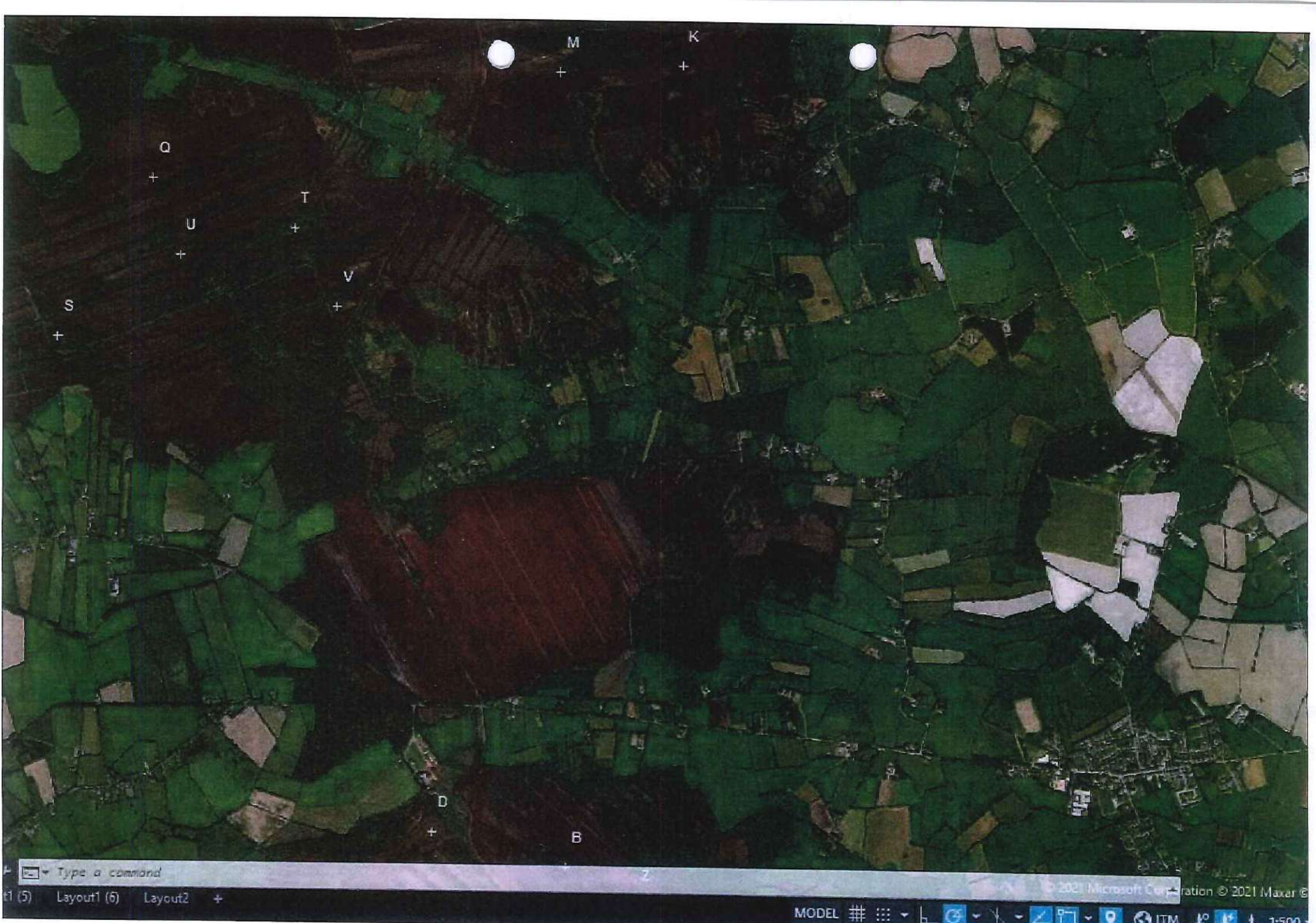
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ITM
1:500
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BPA-BH1
BPA-TP1
BPA-BH2
BPA-TP2
BPA-BH3

Appendix 07
Digital Data (AGS Files)

IRISH DRILLING LIMITED

LOUGHREA, CO. GALWAY, IRELAND

CONTRACT DRILLING
SITE INVESTIGATION

Phone: (091) 841 274
Fax: (091) 847 687

email: info@irishdrilling.ie

BALLIVOR WIND FARM

SITE INVESTIGATION CONTRACT FACTUAL REPORT

ADDITIONAL WORKS

Bord na Mona,
Newbridge,
Co. Kildare.

Fehily Timoney & Company,
Consulting Engineers,
Singleton's Lane,
Bagenalstown,
Carlow.

	Prepared by	Approved by	Rev. Issue Date:	Revision No.
	Ronan Killeen	Declan Joyce	30th August 2021	20 _MH_103/02
Signature				

FOREWORD

The borehole records have been compiled from an examination of the samples by a Geotechnical Engineer and from the Drillers' descriptions.

The report presents an opinion on the configuration of the strata within the site based on the borehole results. The assumptions, though reasonable, are given for guidance only and no liability can be accepted for changes in conditions not revealed by the boreholes.

The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

Contents:

1.0 Introduction.

Irish Drilling Ltd. (IDL) was instructed by Fehily Timoney & Company, Consulting Engineers, on behalf of Bord na Mona, to carry out a site investigation at the site of the proposed Ballivor Wind Farm.

This site investigation was carried out to provide detailed factual geotechnical information of the underlying ground conditions at the proposed wind farm site.

The fieldwork commenced on August 5th 2021 and was completed on August 11th 2021.

2.0 Site & Geology

The site is located near Ballivor, County Meath.

The fieldwork was carried out predominantly on peat lands owned by Bord na Mona.

Site Plans, prepared by the client's representatives and amended by IDL to show approximate 'as-built' locations, are included with this report.

Geological Survey Maps of the area indicate that the site is underlain by the Lower Carboniferous Limestone Rock Formation.

3.0 Fieldwork.

The following plant was mobilised to site to carry out fieldwork operations:

1nr. GT1100 GoTract Rotary Core Drill Rig.

Fieldwork carried out to date has included the following:

Five rotary core boreholes were carried out to establish overburden conditions and rockhead and to establish the nature and integrity of the underlying rock.

The rotary core boreholes were completed using wireline drilling techniques, with HQ size (64mm core diameter, 96mm hole diameter) drill strings to recover soil and rock core samples.

A water based flush system was used as the drilling medium while a biodegradable polymer gel was also used where necessary to aid the drilling and soil / rock recovery process.

The samples were stored in wooden boxes and returned to the laboratory where there were logged and photographed by a Geotechnical Engineer and presented for testing.

The rotary core boreholes were carried out to a depth of 11.00m below ground level.

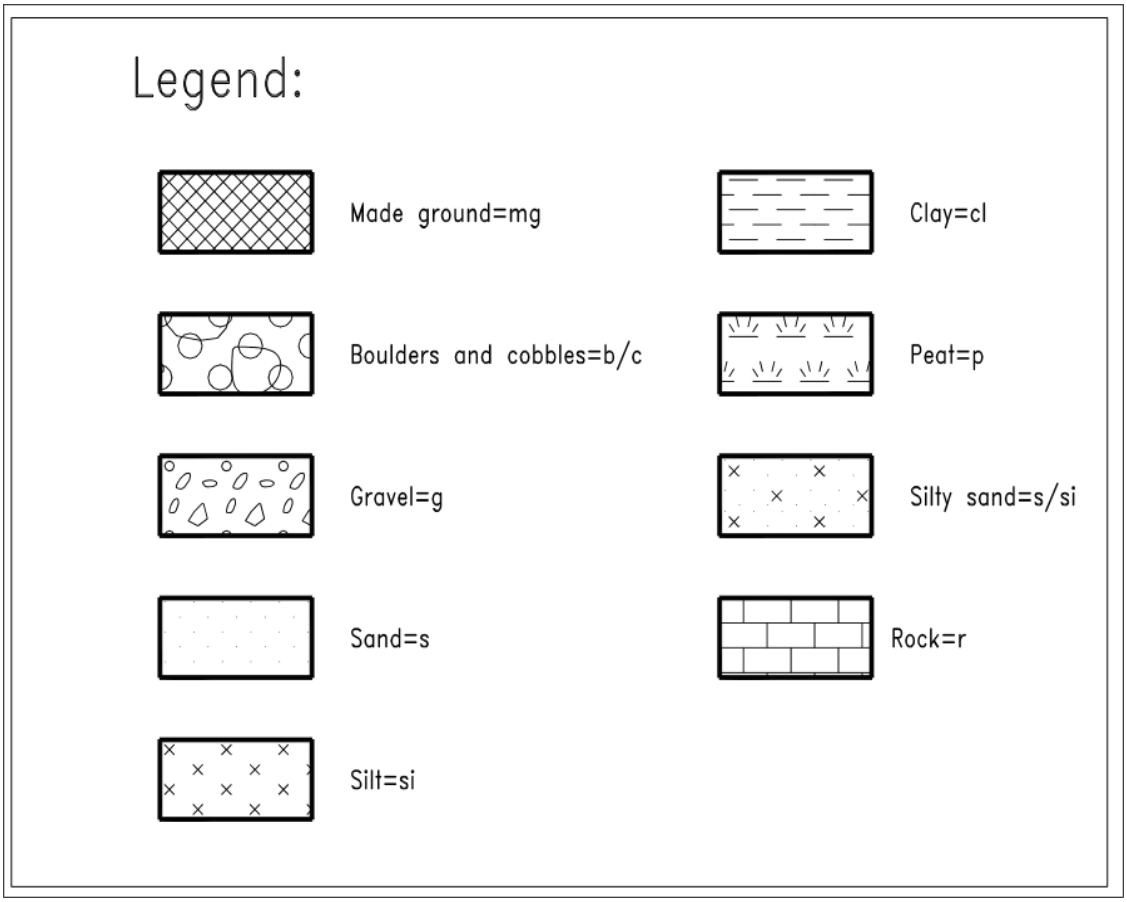
A 50mm diameter standpipe was installed in all the rotary core boreholes to allow for the monitoring of groundwater levels over a prolonged period of time.

The borehole locations were set out on site using a Trimble CU Bluetooth GPS Surveying Unit and the co-ordinates are included on the logs presented in the appendices.

All fieldwork co-ordinates are reported to Irish Transverse Mercator (ITM) with Reduced Levels recorded relative to Malin Head Datum and with an accuracy level of + or – 0.10m.

The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

The following Key Legend Table details the symbology used on the engineering logs to describe ground conditions encountered:



Ground conditions encountered during the completion of the fieldwork were typical and as expected for this region and predominantly consisted of Glacial Tills overlying possible bedrock.

The Glacial Tills in general consisted of silty sands and gravels with occasional, some or many cobbles and boulders.

Bedrock was not encountered in any of the boreholes before borehole termination at 11.00m below ground level.

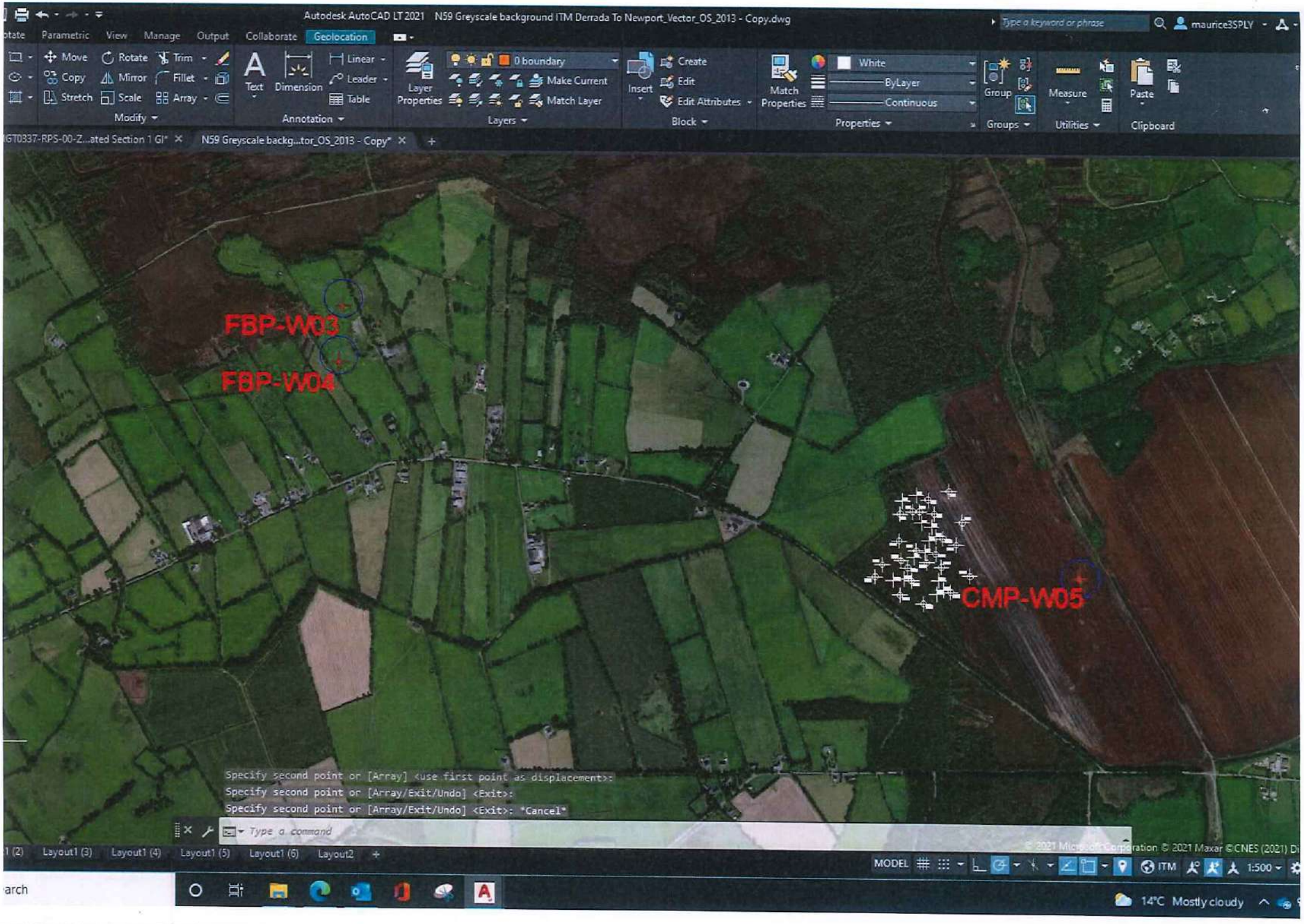
For detailed descriptions of the ground conditions encountered please refer to the engineering logs included in the appendices of this report.

The soil and rock descriptions as noted on the borehole logs are in general visual descriptions as observed and logged by our Engineers and are described in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations.

Soils descriptions (cohesive or otherwise) are also initially assessed based on the texture and 'feel' of the soil materials as witnessed by our Geotechnical Engineers and in accordance with IS EN 1997-2 and BS5930.

The records of all fieldwork and photographs are included in the appendices of this Factual Report.

Ronan Killeen
Chartered Engineer
Irish Drilling Limited
August 30th 2021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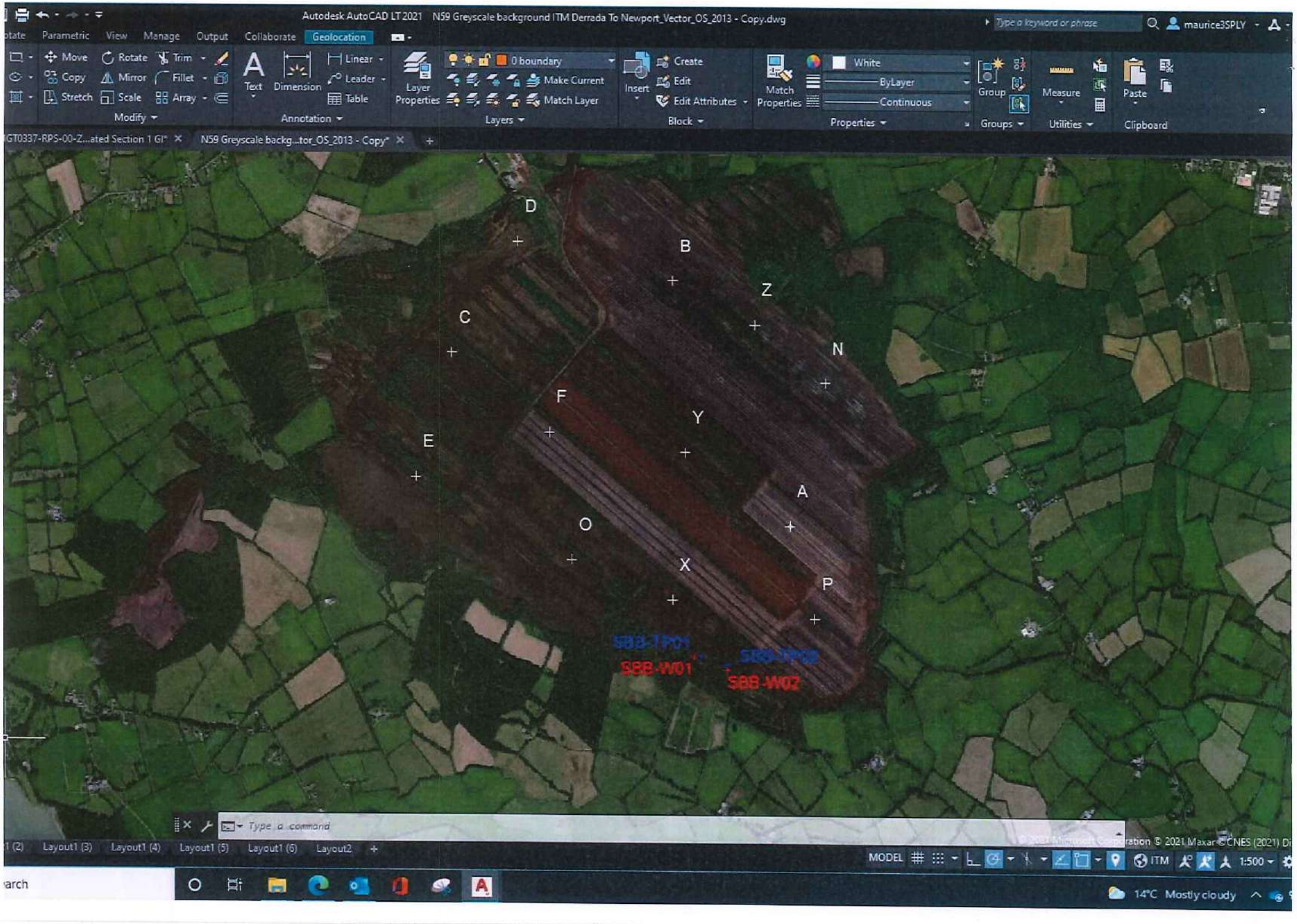
Parametric View Manage Output Collaborate Geolocation
Move Rotate Trim Copy Mirror Fillet Stretch Scale Array Modify
Text Dimension Linear Leader Table Annotation
Layer Properties 0 boundary Make Current Match Layer Layers
Insert Create Edit Edit Attributes Block
Match Properties White ByLayer Continuous Properties
Group Groups
Measure Utilities
Paste Clipboard
FBP-W03
FBP-W04
CMP-W05
Specify second point or [Array] <use first point as displacement>:
Specify second point or [Array/Exit/Undo] <Exit>:
Specify second point or [Array/Exit/Undo] <Exit>: *Cancel*
Type a command
Layout1 (3) Layout1 (4) Layout1 (5) Layout1 (6) Layout2
MODEL ITM 1:500
14°C Mostly cloudy


Autodesk AutoCAD LT 2021
N59 Greyscale background ITM Derrada To Newport_Vector_OS_2013 - Copy.dwg
Parametric
View
Manage
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Collaborate
Geolocation
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Leader
Table
Annotation
Layer Properties
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Block
Match Properties
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Continuous
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Group
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Measure
Utilities
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N59 Greyscale backg...tor_OS_2013 - Copy*
D
B
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SBB-W01
SBB-W02
Type a command
Layout1 (3)
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Layout1 (5)
Layout1 (6)
Layout2
MODEL
ITM
1:500
14°C Mostly cloudy

Appendix 01
Borehole Records (Rotary Core)

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DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**CMP-W05**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	11-08-21 11-08-21	76.84	E 664,190.1 N 755,162.7

Engineer	Sheet	Rev.
FTCO/MKO	1 of 2	DRAFT

RUN DETAILS					STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities / Detail	DESCRIPTION: Main	Geology	Instrument/ Backfill
0.00	0 (-) -	NA			(1.50)	0.00 - 11.00 : overburden.	Open hole drilling - no recovery.		
1.50			75.34		1.50				
3.00	40 (-) -						Greyish brown slightly silty slightly sandy subangular to subrounded fine to coarse assorted light and dark grey limestone GRAVEL with cobbles and boulders. Sand is fine to coarse. Cobbles are of brown sandstone and assorted grey limestone.		
6.00	47 (-) -								
9.00	43 (-) -	NA			(9.50)				
	55						Core run 9.00m to 11.00m: 1 No dark grey silty fine grained limestone boulder 230mm in length.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	5.00	water	100
5	11.00	water	<100

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

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DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**CMP-W05**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	11-08-21 11-08-21	76.84	E 664,190.1 N 755,162.7

Engineer	Sheet	Rev.
FTCO/MKO	2 of 2	DRAFT

RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
T1.08 11.00	(-) -		65.84		11.00			BH terminated at 11.00m bgl on REs instruction.		

Drilling Progress and Water Observations							
Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
11-08-21	14.00	11.00	1.50	99	63		

Rotary Flush			
From (m)	To (m)	Type	Return (%)

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

Irish drilling LTD

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**FBP-W03**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	05-08-21 05-08-21	82.35	E 661,711.1 N 756,061.8

Engineer	Sheet	Rev.
FTCO/MKO	1 of 2	DRAFT

RUN DETAILS					STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities / Detail	DESCRIPTION: Main	Geology	Instrument / Backfill
0.00	0 (-) -	NA			(1.50)	0.00 - 11.00 : overburden.	Open hole drilling - no recovery.		
1.50			80.85		1.50				
	67 (-) -						Brown slightly gravelly silty fine and medium SAND with cobbles. Gravel is subrounded fine to coarse of brown sandstone and assorted grey limestone. Cobbles are of assorted grey limestone.		
3.00									
	63 (-) -								
6.00									
		NA			(9.50)				
	60 (-) -								
9.00									
	70								

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	11.00	water	100

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

Irish drilling LTD

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**FBP-W03**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	05-08-21 05-08-21	82.35	E 661,711.1 N 756,061.8

Engineer	Sheet	Rev.
FTCO/MKO	2 of 2	DRAFT

RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
05.08 11.00	(-) -		71.35		11.00			Brown slightly gravelly silty fine and medium SAND with cobbles. Gravel is subrounded fine to coarse of brown sandstone and assorted grey limestone. Cobbles are of assorted grey limestone. *(continued)*		
								BH terminated at 11.00m bgl on REs instruction.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
05-08-21	14.00	11.00	1.50	99	63		

Rotary Flush

From (m)	To (m)	Type	Return (%)

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

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DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**FBP-W04**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	05-08-21 05-08-21	85.88	E 661,699.0 N 755,871.2

Engineer	Sheet	Rev.
FTCO/MKO	1 of 2	DRAFT

RUN DETAILS					STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities / Detail	DESCRIPTION: Main	Geology	Instrument / Backfill
0.00	0 (-) -	NA	84.38		(1.50)	0.00 - 11.00 : overburden.	Open hole drilling - no recovery.		
1.50					1.50				
	100 (-) -						Brownish grey silty slightly fine to coarse SAND with cobbles. Gravel is subrounded to rounded fine to coarse of assorted grey limestone. Cobbles are of assorted grey limestone.		
3.00									
	80 (-) -								
6.00					(9.50)				
	67 (-) -	NA							
9.00									
	85								

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	11.00	water	100

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

Irish drilling LTD

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**FBP-W04**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	05-08-21 05-08-21	85.88	E 661,699.0 N 755,871.2

Engineer	Sheet	Rev.
FTCO/MKO	2 of 2	DRAFT

RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
05.08 11.00	(-) -		74.88		11.00			Brownish grey silty slightly fine to coarse SAND with cobbles. Gravel is subrounded to rounded fine to coarse of assorted grey limestone. Cobbles are of assorted grey limestone. *(continued)*		
								BH terminated at 11.00m bgl on REs instruction.		

Drilling Progress and Water Observations							
Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
05-08-21	17.30	11.00	1.50	99	63		

Rotary Flush			
From (m)	To (m)	Type	Return (%)

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

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DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**SBB-W01**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	09-08-21 09-08-21	71.77	E 665,282.3 N 751,468.4

Engineer: FTCO/MKO

Sheet 1 of 2

Rev. DRAFT

RUN DETAILS					STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities / Detail	DESCRIPTION: Main	Geology	Instrument / Backfill
0.00	0 (-) -	NA			(1.50)	0.00 - 11.00 : overburden.	Open hole drilling - no recovery.		
1.50			70.27		1.50				
3.00	40 (-) -						Brown slightly silty sandy subrounded to rounded fine to coarse assorted brown sandstone and assorted light and dark grey limestone GRAVEL. Sand is fine to coarse.		
6.00	27 (-) -								
9.00	25 (-) -	NA			(9.50)				
	38								

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	5.00	water	100
5	11.00	water	<100

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

IDL AGS UK DH (SPTS) BALLIVOR RC NEW FILE 1 AUG 26 2021.GPJ IDL TP TEMPLATE.GDT 27/8/21

Irish drilling LTD

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**SBB-W01**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	09-08-21 09-08-21	71.77	E 665,282.3 N 751,468.4

Engineer	Sheet	Rev.
FTCO/MKO	2 of 2	DRAFT

RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
09.08 11.00	(-) -		60.77		11.00			Brown slightly silty sandy subrounded to rounded fine to coarse assorted brown sandstone and assorted light and dark grey limestone GRAVEL. Sand is fine to coarse. *(continued)*		
								BH terminated at 11.00m bgl on REs instruction.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
09-08-21	14.00	11.00	1.50	99	63		

Rotary Flush

From (m)	To (m)	Type	Return (%)

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

IDL AGS UK DH (SPTS) BALLIVOR RC NEW FILE 1 AUG 26 2021.GPJ IDL TP TEMPLATE.GDT 27/8/21

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DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**SBB-W02**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	10-08-21 10-08-21	77.33	E 665,464.3 N 751,452.5

Engineer	Sheet	Rev.
FTCO/MKO	1 of 2	DRAFT

RUN DETAILS						STRATA				
Depth / Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION: Discontinuities	Detail	Main	Geology	Instrument/ Backfill
0.00	0 (-) -	NA	75.83		(1.50)	0.00 - 11.00 : overburden.		Open hole drilling - no recovery.		
1.50					1.50					
	40 (-) -							Brown slightly silty sandy subrounded to rounded fine to coarse assorted brown sandstone and assorted light and dark grey limestone GRAVEL. Sand is fine to coarse.		
3.00										
	45 (-) -									
6.00										
	50 (-) -	NA			(9.50)					
9.00								9.00m: becoming sandy. Sand is fine.		
	85									

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing

Rotary Flush

From (m)	To (m)	Type	Return (%)
0	11.00	water	100

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

Irish drilling LTD

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Ballivor Wind Farm	Ballivor, Co. Meath	**SBB-W02**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
2020MH103	10-08-21 10-08-21	77.33	E 665,464.3 N 751,452.5

Engineer	Sheet	Rev.
FTCO/MKO	2 of 2	DRAFT

RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
T0.08 11.00	(-) -		66.33		11.00			Brown slightly silty sandy subrounded to rounded fine to coarse assorted brown sandstone and assorted light and dark grey limestone GRAVEL. Sand is fine to coarse. *(continued)*		
								BH terminated at 11.00m bgl on REs instruction.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
10-08-21	14.00	11.00	1.50	99	63		

Rotary Flush

From (m)	To (m)	Type	Return (%)

GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

All dimensions in metres Scale 1:62.5	Client: Bord na Mona	Method/ Plant Used: Hydreq	Bit: HQ Design	Driller: GF	Logged By: EAT

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Appendix 02
Photographs (Rotary Core)


Ballivor
Wind Farm
Co. Meath
2020 MH 103
CMP W 05
Box
1.2
START
1.5M
6M
9M
11M
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150


Ballivor
Wind Farm
Co. Meath
2020 MH 103
FBP W 03
Box
1.2
START
1.5M
6M
9M
11M
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150


Ballivor
Wind Farm
Co. Meath
2020 MH 103
FBP W 0 4
Box
1.2.3
1.5M
3M
6M
9M
11M


Ballivor
Wind Farm
Co. Meath
2020 MH 103
SBB W 0 1
Box
1.
START
1.5
3M
6M
9M


Ballivor
Wind Farm
Co. Meath
2020 MH 103
SBB W 0 2
Box
1.2.
3m
11M
11m EOH

Appendix 03
Digital Data (AGS Files)

TP ID	BPA-TP-05	BPA-TP-06	BPA-TP-07	BPA-TP-08	BPA-TP-09	BPA-TP-10	BPA-TP-11	TP-ENT1
Soil	0.2 m peat 0.4 Firm grey Sandy gravelly SILT 0.5 silty or very silty v Sandy GRAVEL	0.2 m peat 0.3 m Sandy silty GRAVEL 0.5 soft gravelly Sandy SILT 1.7 silty Sandy GRAVEL with low cobbles boulders	0.2 peat 0..5 Firm grey brown Sandy gravelly CLAY with low cobbles and low Boulder coment. Boulder 500 mm 2.0 Grey silty very Sandy GRAVEL. Cobbles and boulders increasing with deprh	1.1 very soft peat 1.5 Soft light brown CLAY 1.6 grey silty Sandy GRAVEL	0.2 peat 0.6 Firm light brown mottled grey with dark grey angular gravels 0.7 grey silty Sandy GRAVEL	0.1 m topsoil 0.5 m grey slight silty Sandy GRAVEL with low cobbles and low Boulder	0.8 soft - very soft PEAT 1.5 grey silty Sandy GRAVEL	0.8 soft - very soft PEAT 1.2 m firm Light brown brown Sandy CLAY 1.8 m Grey silty Sandy GRAVEL with low cobble
Bottom of Pit	0.5	1.7	2	1.6	0.7	0.5	1.5	1.8
Depth of Peat	0.2	0.2	0.2	1.1	0.2	0.1	0.8	0.8
Depth to Gravel	0.4	0.5	0.5	1.5	0.6	0.1	0.8	1.2
Samples		Sample 1.1	Sample 2.0		Sample 0.7 m		Sample 1.5	Sample 1.7 m
Water remarks	Dry	1.7 slight seepage	Dry	Dry	Dry	Dry	Dry	Dry
Stablity	Stable	Stable	Stable refuse on boulders	Stable	Stable	Stable	Stable	Stable
x	664203	664245	664217	664131	664215	664121	664261	664577
y	754860	754938	755206	755370	755116	755363	755321	754536
z (taken from 2020 LiDAR)	76.9	74.2	74.8	76.4	75.4	77.4	79.2	76.9
Date	19/03/2021	19/03/2021	19/03/2021	19/03/2021	19/03/2021	19/03/2021	19/03/2021	19/03/2021

Excavator: Hitachi Zaxis 120 - Wide Tracked Excavtor with Wide Ditching Bucket for all Pits

Groundwater Readings

Bpa bh01
Dry throughout
no water inside standpipe -
depth measured = 4. 8 m BGL

Bpabh3
Water 2.5 m bgl

TP-ENT2	TP-ENT3	TP-SUB-01	TP-SUB-02	TP-SUB-04	TP-SUB-05	TP-SUB-07	TP-SUB-08a	TP-SUB-09
1.4 m soft - very soft PEAT	0.8 soft - very soft PEAT	2.0 m soft - very soft PEAT	0.6 m peat	2.1 soft - very soft with light brown decomposed wood and occasional logs	1.8 m soft - very soft with light brown decomposed wood and occasional logs	1.7 soft - very soft PEAT	0.5 peat	2.3 m soft - very soft with light brown decomposed wood and occasional logs
1.7 soft light brown Andy gravelly CLAY	1.9 Firm grey Sandy gravelly CLAY	2.9 Firm grey slightly Sandy SILT	1.2 soft grey Sandy very gravelly SILT	2.2 Firm grey slight Sandy slight gravelly SILT	2.4 firm sl Sandy gravelly CLAY	2.2 firm Sandy gravelly SILT	2.0 Silty gravelly Sand low cobbles	2.5 Soft SILT
1.8 Grey silty Sandy GRAVEL with low cobble	2.2 very CLAYey Sandy GRAVEL or GRAVELly Sandy CLAY		3.7 m silty Sandy GRAVEL with medium cobble and low boulder		2.5 soft sl Sandy gravelly SILT with traces of green SILT			2.7 firm slightly Sandy SILT
1.8	2.2	2.9	3.7	2.2	2.5	2.2	2	2.7
1.4	0.8	2	0.6	2.1	1.8	1.7	0.5	2.3
1.7	1.9		1.2				0.5	
Seepage at 0.9 Stable	Dry Stable	Slight to moderate seepage from 2 m	Sample at 3.3 m 2.4 moderate seepage Side walls undermining	Dry Stable	Dry Stable	Sample 2.2 Dry Stable	Sample 2 m Moderate water 2m Stable	Slight seepage at base Stable
664557	664521	664104	664204	664137	664123	664155	664140	664169
754562	754542	754822	754797	754775	754744	754836	754754	754744
76.4	76.7	73.8	75.3	76.1	75.7	75.1	75.9	74.9
19/03/2021	19/03/2021	18/03/2021	18/03/2021	18/03/2021	18/03/2021	18/03/2021	18/03/2021	18/03/2021

TP-SUB-10	TP-SUB-11	TP-SUB-12	TP-SUB-13	TP-SUB-14	TP-SUB-16	TP-SUB-17
2.1 soft - very soft with light brown decomposed wood and occasional logs	2.4 m soft - very soft with light brown decomposed wood and occasional logs	2.4 soft - very soft with light brown decomposed wood and occasional logs	2.5 soft - very soft with light brown decomposed wood and occasional logs	1.7 m soft - very soft PEAT	2.4 soft - very soft with light brown decomposed wood and occasional logs	3.6 soft - very soft with light brown decomposed wood and occasional logs
2.3 soft grey Sandy Silt	2.7 grey soft Sandy SILT	2.7 firm Sandy gravelly SILT	2.7 soft to firm Sandy SILT	2.4 soft slightly Sandy SILT	2.8 soft grey sl. Sandy SILT	4.0 soft grey Sandy sl gravelly SILT
2.5 firm to stiff Sandy gravelly SILT	3.1 grey silty very gravelly SAND		2.9 silty Sandy GRAVEL	2.5 very silty Sandy GRAVEL	3.3 firm grey very Sandy slightly grav SILT	4.3 silty Sandy GRAVEL
2.5 2.1	3.1 2.4	2.7 2.4	2.9 2.5	2.5 1.7	3.3 2.4	4.3 3.6
	2.7		2.7	2.4		4
Slow seepage at 1.9 m and 2.5 m Stable	Dry Stable	Sample 2.7 Moderate seepage at 2.2 Stable	Sample 2.8 Dry Stable	Moderate water seepage 2.4 m Stable	Sample 3.3 m Dry Stable	Dry Stable
664142 755052 74.1	664216 755098 75.0	664175 754989 74.2	664210 754983 75.6	664209 754951 74.0	664253 755035 74.5	664251 755013 75.6
18/03/2021	18/03/2021	18/03/2021	18/03/2021	18/03/2021	18/03/2021	18/03/2021

Project ID	2020Lab104	Client		Remarks	Turnaround
Project Name	Ballivor Wind Farm	Due Date	31/03/2021 15:50		
Schedule ID	2020Lab104_2	Scheduled Date	31/03/2021 15:52		

Sample Details							Classification						Chemical / Concrete								Compaction					Compressibility			Strength (Total)							Shear Stregth (Effective Stress)			Rock		Other							
Location	Depth (m)	Base Depth	Sample Type	Sample Ref	Date Sampled	Storage	Moisture Content	Atterberg 4 Point	Particle Density by Gas Jar	Particle Density by Small Pyknometer	Particle Size Distribution	Hydrometer	Organic Content	Loss On Ignition	Sulphate Total	Sulphate Water Gravimetric	Carbonate Titration	ph	Chloride Content	Chloride Content Acid	Compaction Light	Compaction Heavy	Compaction Vibrating Hammer	Moisture Condition Value	Moisture Condition Relationship	CBR	Consolidation	Pressures	Swelling Pressure Test	Laboratory Vane test	Small Direct Shearbox	Ring shear Test	Triaxial Quick Undrained	(Specify Cell Pressure)	Triaxial UU Multi Stage	Triaxial UU Multi Specimen	Consolidated Drained Triaxial Test	Consolidated Undrained Triaxial Test	Consolidated Undrained Triaxial Multis	Rock Uniaxial compression	Point Load	Sample Description Test						
BPA-TP-06	1.10		B	1	19/03/21	AU86	1				1																													1						
BPA-TP-07	2.00		B	1	19/03/21	AU86	1				1																													1						
BPA-TP-09	0.70		B	1	19/03/21	AU86	1				1																													1						
BPA-TP-11	1.50		B	1	19/03/21	AU86	1				1																													1						
TP-ENT1	1.70		B	1	19/03/21	AU86	1				1																													1						
TP-SUB-02	3.30		B	1	19/03/21	AU86	1				1																													1						
TP-SUB-07	2.20		B	1	19/03/21	AU86	1	1			1																													1						
TP-SUB-08A	2.00		B	1	19/03/21	AU86	1				1																													1						
TP-SUB-12	2.70		B	1	19/03/21	AU86	1				1																													1						
TP-SUB-13	2.80		B	1	18/03/21	AU86	1				1																													1						
TP-SUB-16	3.30		B	1	18/03/21	AU86	1				1																													1						

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

Summary of Classification Test Results

Project No.	Project Name
2020Lab104	Ballivor Wind Farm

Hole No.	Sample					Soil Description	Density		*w*	Passing 425µm	LL	PL	PI	Particle density	Remarks
	Ref	Top	Base	Type			bulk	dry							
							Mg/m3		%	%	%	%	%	Mg/m3	
BPA-TP-06	1	1.10		B		Grey very sandy very silty fine GRAVEL.			23.0	35					
BPA-TP-07	1	2.00		B		Grey very silty very sandy fine and medium GRAVEL. Sand is coarse.			14.0	28					
BPA-TP-09	1	0.70		B		Grey sandy very silty medium and coarse GRAVEL.			23.0	29					
BPA-TP-11	1	1.50		B		Grey silty sandy medium GRAVEL.			15.0	18					
TP-ENT1	1	1.70		B		Brown sandy silty medium and coarse GRAVEL.			12.0	21					
TP-SUB-02	1	3.30		B		Grey silty very sandy medium GRAVEL.			18.0	20					
TP-SUB-07	1	2.20		B		Brown gravelly very sandy SILT.			28.0	70					NP
TP-SUB-08A	1	2.00		B		Grey silty very sandy medium and fine GRAVEL.			9.9	17					
TP-SUB-12	1	2.70		B		Grey slightly gravelly slightly sandy SILT.			21.0	69					
TP-SUB-13	1	2.80		B		Grey very silty very sandy medium GRAVEL.			12.0	40					
TP-SUB-16	1	3.30		B		Grey sandy SILT. Sand is fine.			23.0	95					

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: Linear measurement unless : wd - water displacement; wi - immersion in water

Liquid Limit: 4pt cone unless : 1pt - single point test; NP - Non Plastic

Particle density: sp - small pyknometer; gj - gas jar

Date Printed	Approved By	Table
14/04/2021		1
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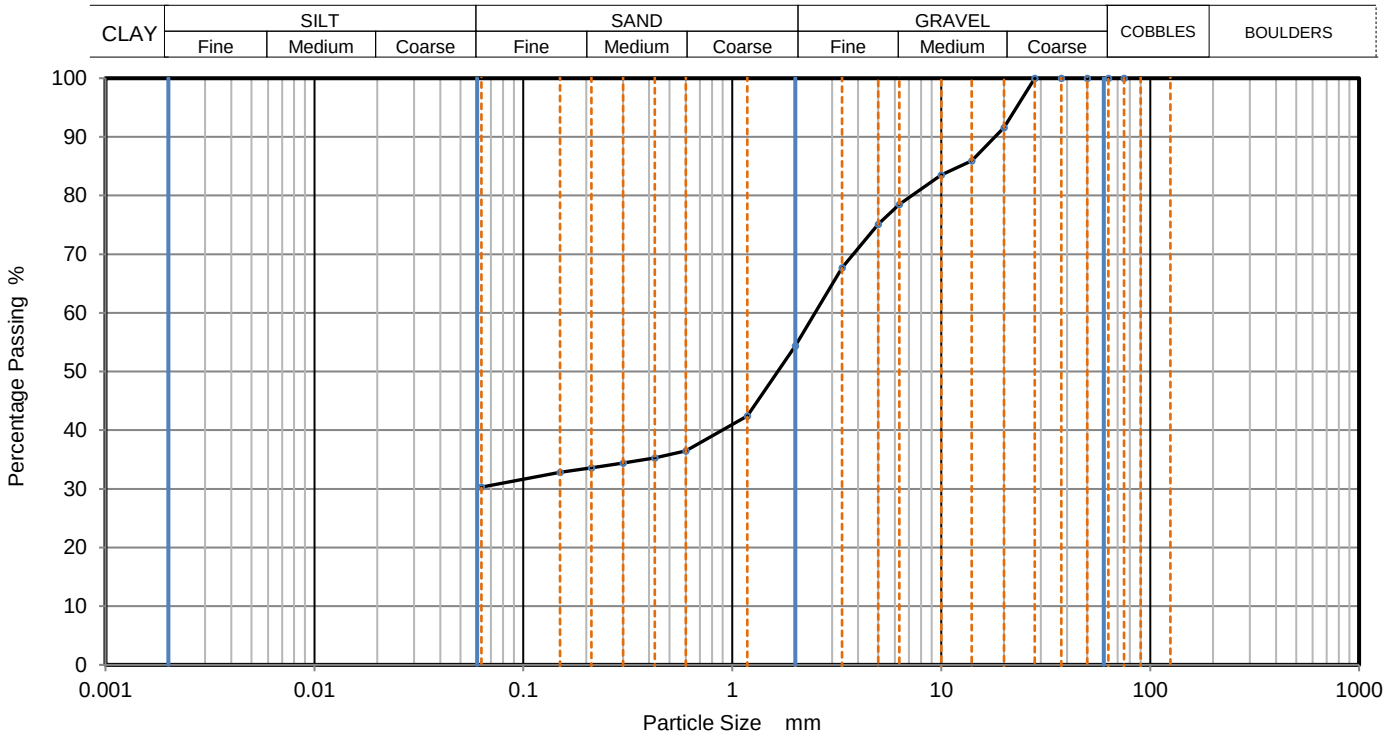
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

PARTICLE SIZE DISTRIBUTION

				Job Ref	**2020Lab104**
				Borehole/Pit No.	BPA-TP-06
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey very sandy very silty fine GRAVEL.			Depth, m	1.10
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103310



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	92		
14	86		
10	84		
6.3	79		
5	75		
3.35	68		
2	54		
1.18	42		
0.6	37		
0.425	35		
0.3	34		
0.212	34		
0.15	33		
0.063	30		

Dry Mass of sample, g: 460

Sample Proportions	% dry mass
Very coarse	0
Gravel	46
Sand	24
Fines <0.063mm	30

Grading Analysis		
D100	mm	
D60	mm	2.48
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	14/04/2021 11:12	**1** QC From No:R2

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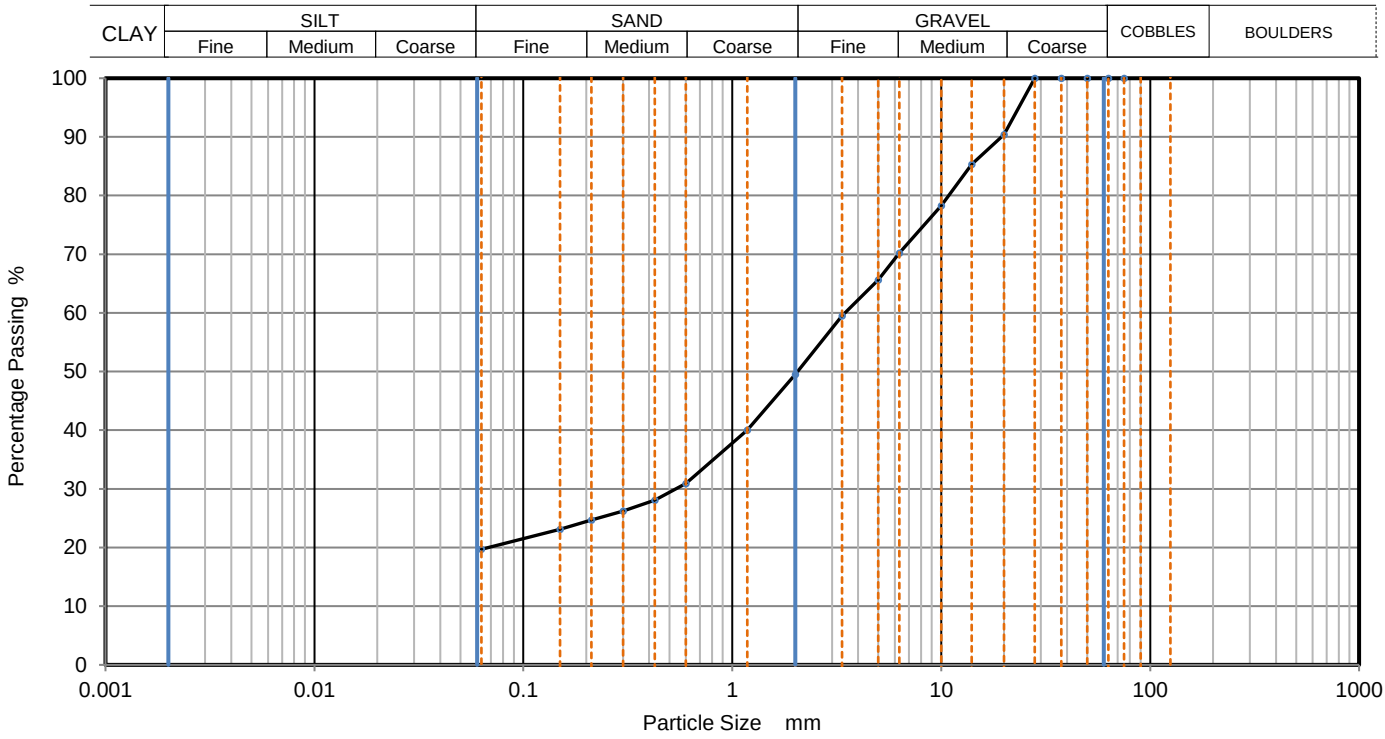
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	BPA-TP-07
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey very silty very sandy fine and medium GRAVEL. Sand is coarse.			Depth, m	2.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103311



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	90		
14	85		
10	78		
6.3	70		
5	66		
3.35	60		
2	50		
1.18	40		
0.6	31		
0.425	28		
0.3	26		
0.212	25		
0.15	23		
0.063	20		

Dry Mass of sample, g	519

Sample Proportions	% dry mass
Very coarse	0
Gravel	51
Sand	30
Fines <0.063mm	20

Grading Analysis		
D100	mm	
D60	mm	3.46
D30	mm	0.538
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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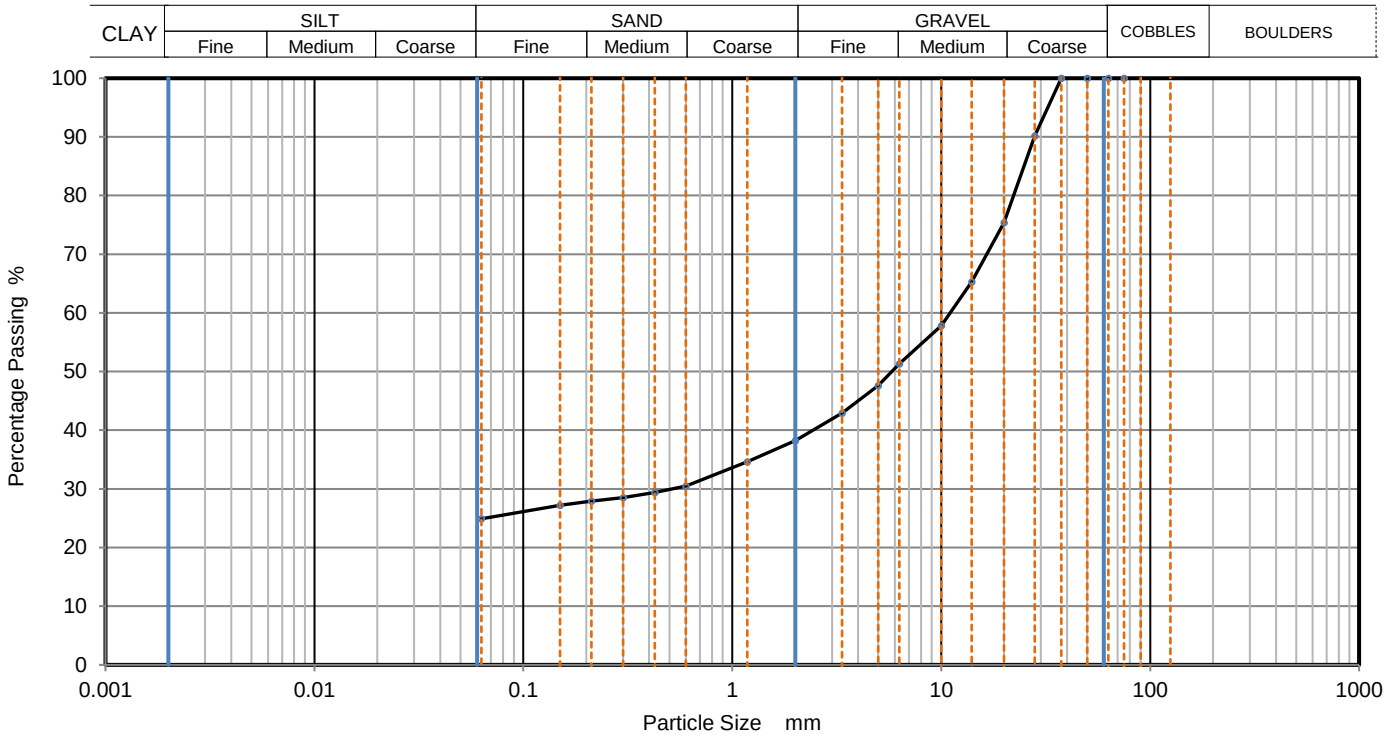
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	BPA-TP-09
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey sandy very silty medium and coarse GRAVEL.			Depth, m	0.70
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103312



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	90		
20	75		
14	65		
10	58		
6.3	51		
5	48		
3.35	43		
2	38		
1.18	35		
0.6	31		
0.425	29		
0.3	29		
0.212	28		
0.15	27		
0.063	25		

Dry Mass of sample, g	530

Sample Proportions	% dry mass
Very coarse	0
Gravel	62
Sand	13
Fines <0.063mm	25

Grading Analysis		
D100	mm	
D60	mm	11.1
D30	mm	0.508
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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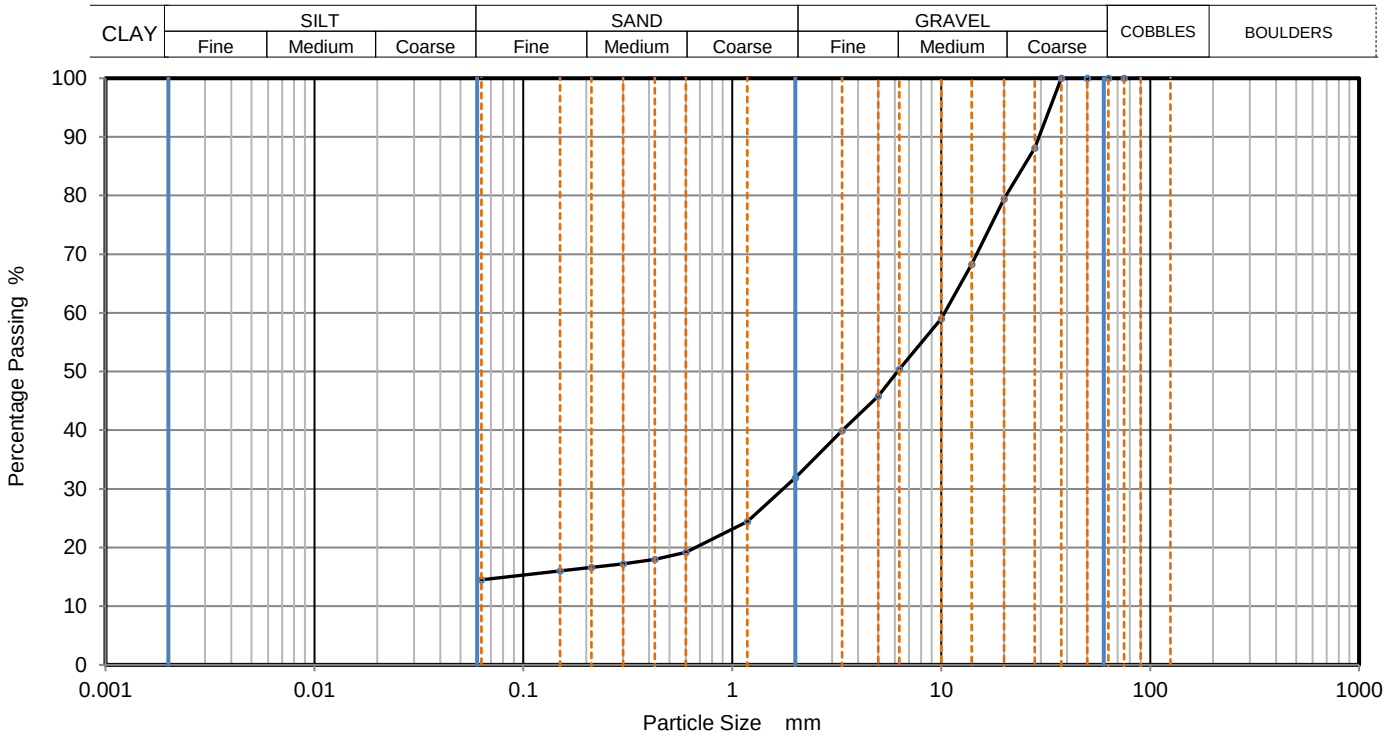
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	BPA-TP-11
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey silty sandy medium GRAVEL.			Depth, m	1.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103313



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	88		
20	79		
14	68		
10	59		
6.3	50		
5	46		
3.35	40		
2	32		
1.18	24		
0.6	19		
0.425	18		
0.3	17		
0.212	17		
0.15	16		
0.063	15		

Dry Mass of sample, g	462

Sample Proportions	% dry mass
Very coarse	0
Gravel	68
Sand	18
Fines <0.063mm	14

Grading Analysis		
D100	mm	
D60	mm	10.4
D30	mm	1.75
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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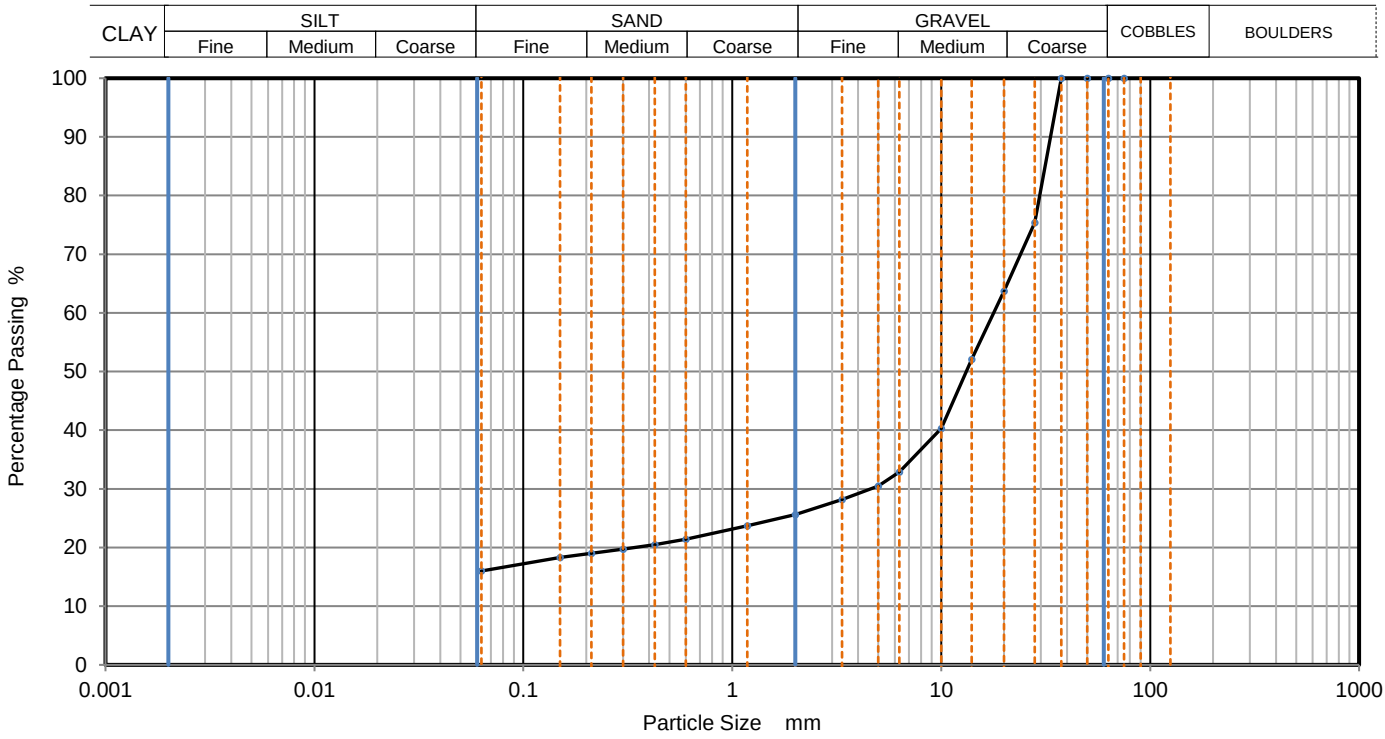
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TP-ENT1
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Brown sandy silty medium and coarse GRAVEL.			Depth, m	1.70
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103314



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	75		
20	64		
14	52		
10	40		
6.3	33		
5	31		
3.35	28		
2	26		
1.18	24		
0.6	21		
0.425	21		
0.3	20		
0.212	19		
0.15	18		
0.063	16		

Dry Mass of sample, g	615

Sample Proportions	% dry mass
Very coarse	0
Gravel	74
Sand	10
Fines <0.063mm	16

Grading Analysis		
D100	mm	
D60	mm	17.8
D30	mm	4.59
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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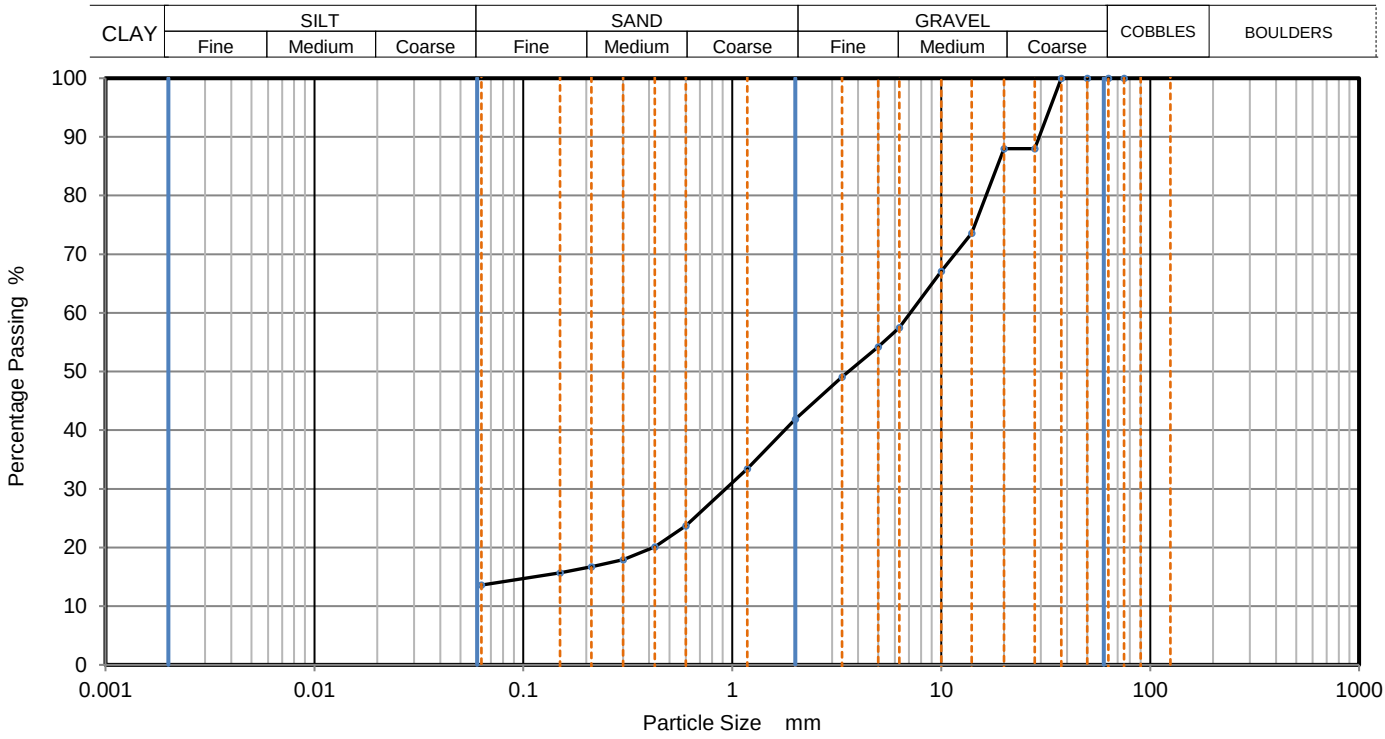
PARTICLE SIZE DISTRIBUTION

				Job Ref	**2020Lab104**
				Borehole/Pit No.	TP-SUB-02
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey silty very sandy medium GRAVEL.			Depth, m	3.30
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103315



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	88		
20	88		
14	74		
10	67		
6.3	58		
5	54		
3.35	49		
2	42		
1.18	33		
0.6	24		
0.425	20		
0.3	18		
0.212	17		
0.15	16		
0.063	14		

Dry Mass of sample, g	732

Sample Proportions	% dry mass
Very coarse	0
Gravel	58
Sand	28
Fines <0.063mm	14

Grading Analysis		
D100	mm	
D60	mm	7.12
D30	mm	0.929
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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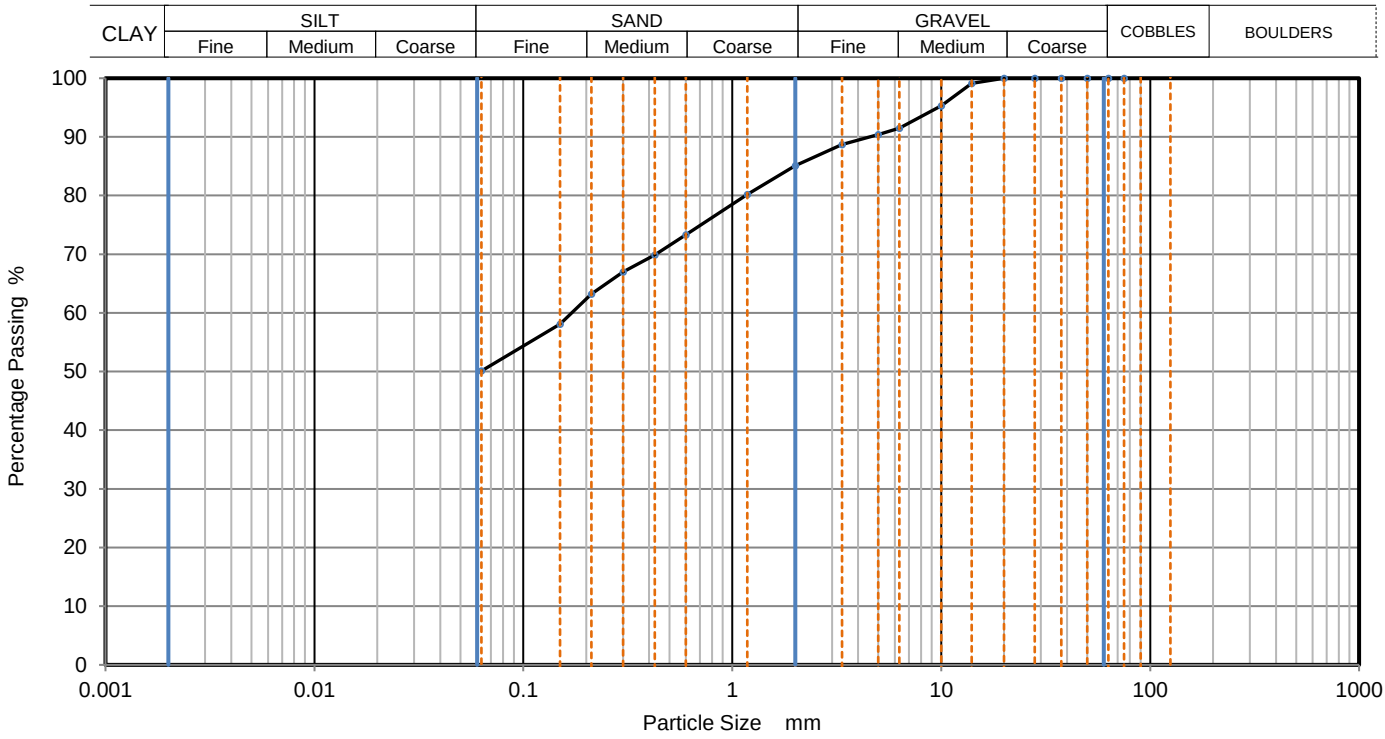
IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TP-SUB-07
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Brown gravelly very sandy SILT.			Depth, m	2.20
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103316



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	95		
6.3	92		
5	90		
3.35	89		
2	85		
1.18	80		
0.6	73		
0.425	70		
0.3	67		
0.212	63		
0.15	58		
0.063	50		

Dry Mass of sample, g	504

Sample Proportions	% dry mass
Very coarse	0
Gravel	15
Sand	35
Fines <0.063mm	50

Grading Analysis		
D100	mm	
D60	mm	0.17
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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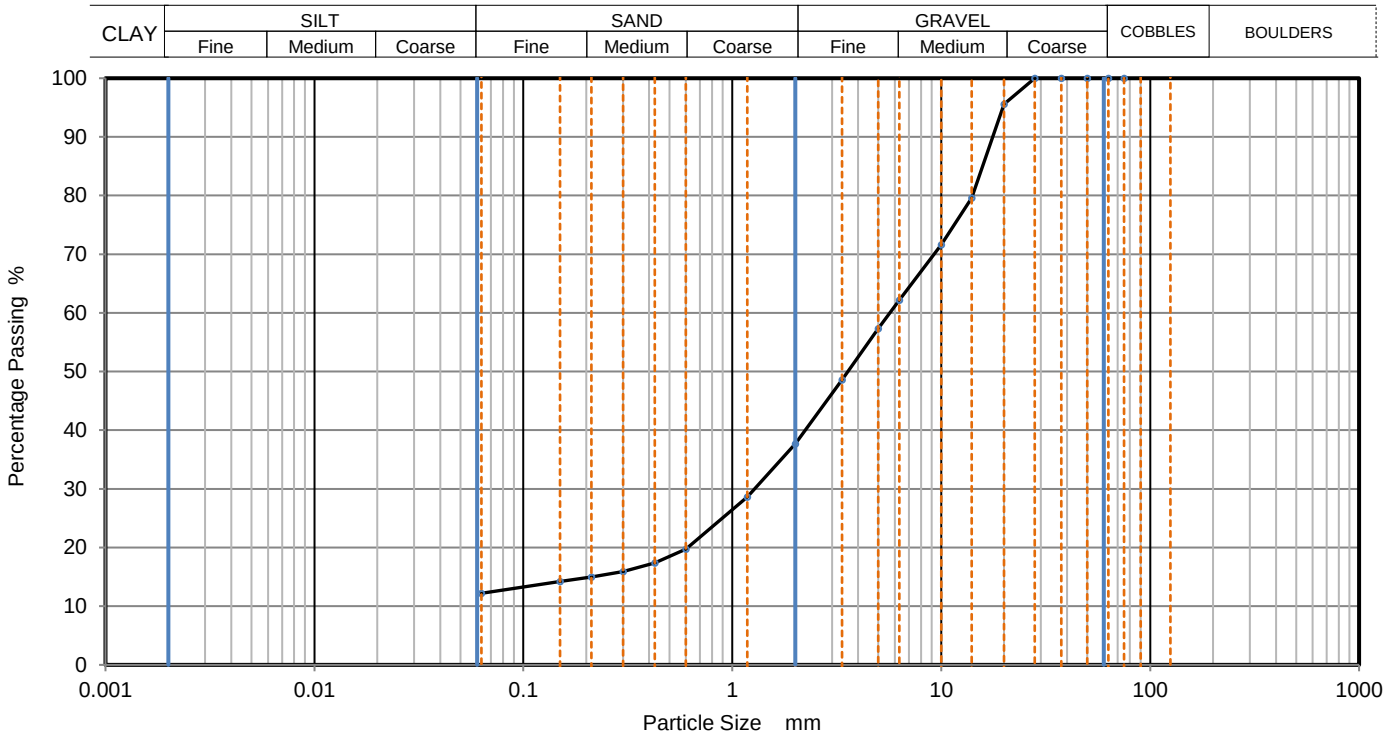
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TP-SUB-08A
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey silty very sandy medium and fine GRAVEL.			Depth, m	2.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103317



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	80		
10	72		
6.3	62		
5	57		
3.35	49		
2	38		
1.18	29		
0.6	20		
0.425	17		
0.3	16		
0.212	15		
0.15	14		
0.063	12		

Dry Mass of sample, g	643

Sample Proportions	% dry mass
Very coarse	0
Gravel	62
Sand	26
Fines <0.063mm	12

Grading Analysis		
D100	mm	
D60	mm	5.68
D30	mm	1.28
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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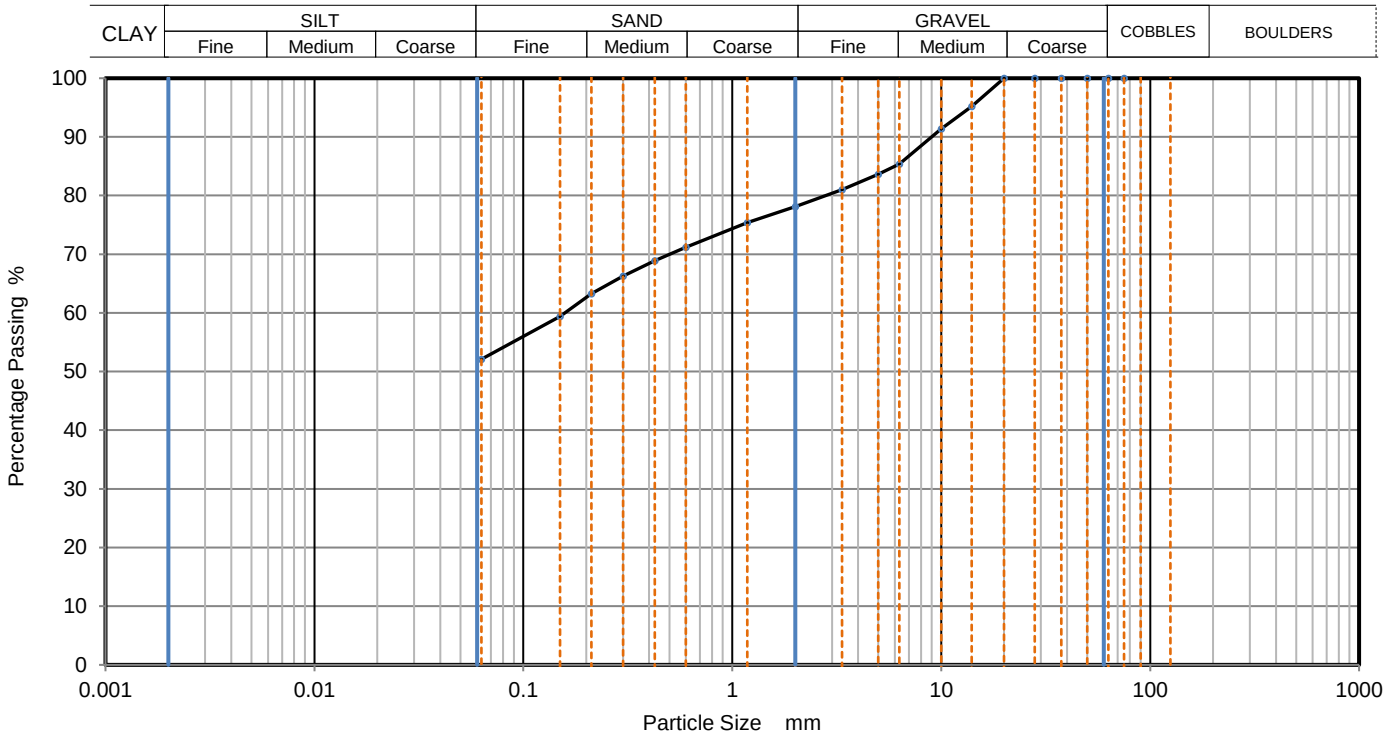
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TP-SUB-12
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey slightly gravelly slightly sandy SILT.			Depth, m	2.70
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103318



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	95		
10	91		
6.3	85		
5	84		
3.35	81		
2	78		
1.18	75		
0.6	71		
0.425	69		
0.3	66		
0.212	63		
0.15	59		
0.063	52		

Dry Mass of sample, g	555

Sample Proportions	% dry mass
Very coarse	0
Gravel	22
Sand	26
Fines <0.063mm	52

Grading Analysis		
D100	mm	
D60	mm	0.158
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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		Dympna Darcy B.Sc.	14/04/2021 11:12	**1** QC From No:R2

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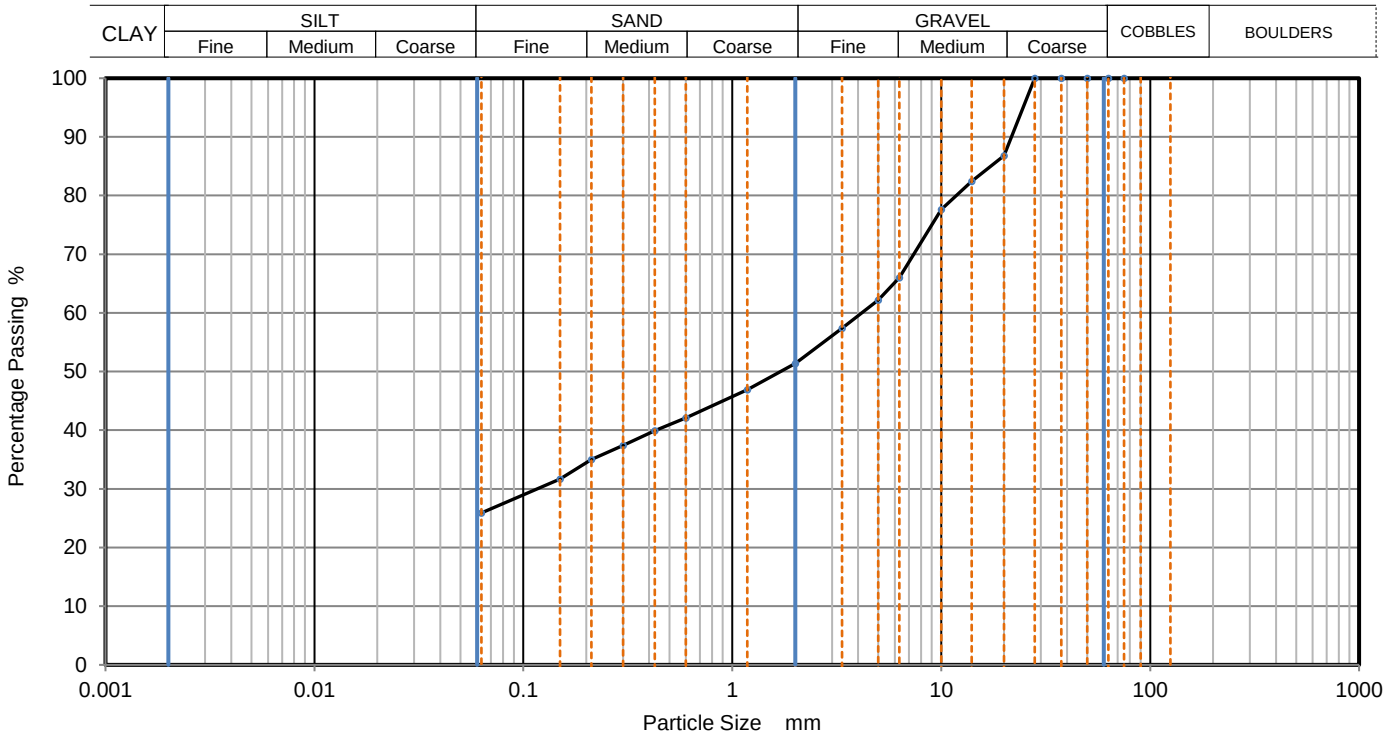
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TP-SUB-13
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey very silty very sandy medium GRAVEL.			Depth, m	2.80
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL1202103319



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	87		
14	82		
10	78		
6.3	66		
5	62		
3.35	57		
2	51		
1.18	47		
0.6	42		
0.425	40		
0.3	37		
0.212	35		
0.15	32		
0.063	26		

Dry Mass of sample, g	513

Sample Proportions	% dry mass
Very coarse	0
Gravel	49
Sand	26
Fines <0.063mm	26

Grading Analysis		
D100	mm	
D60	mm	4.16
D30	mm	0.116
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

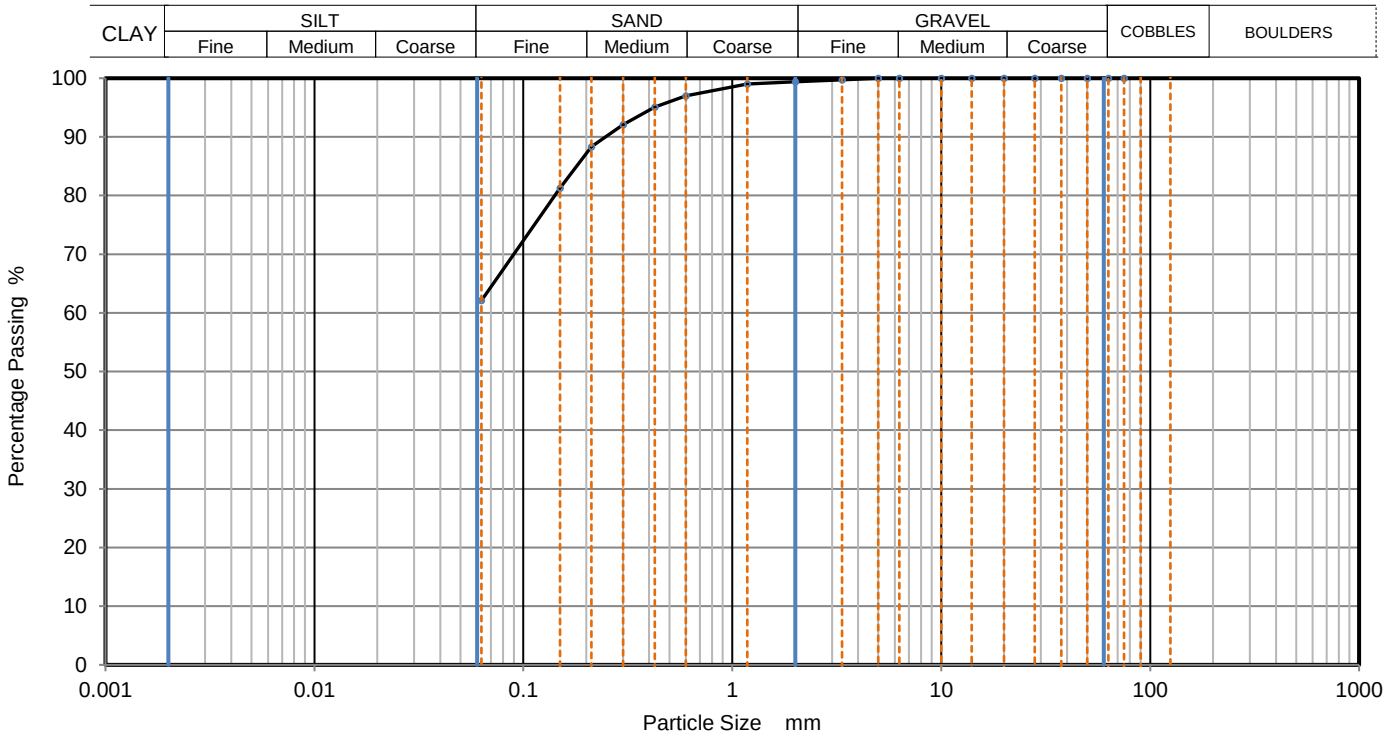
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	14/04/2021 11:12	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2020Lab104**
				Borehole/Pit No.	TP-SUB-16
Site Name	Ballivor Wind Farm			Sample No.	1
Soil Description	Grey sandy SILT. Sand is fine.			Depth, m	3.30
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12021033110



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	97		
0.425	95		
0.3	92		
0.212	88		
0.15	81		
0.063	62		

Dry Mass of sample, g	476

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	37
Fines <0.063mm	62

Grading Analysis		
D100	mm	
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	14/04/2021 11:12	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

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