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APPENDIX 9.1

Geotechnical Assessment Report

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CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

FAHY BEG WIND FARM

GEOTECHNICAL ASSESSMENT REPORT

Prepared for: RWE Renewables Ireland Ltd.

RWE

Date: August 2022

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1. INTRODUCTION

1.1 General

RWE Renewables Ireland (RWE) are applying to Clare County Council for consent for the proposed Fahy Beg Wind Farm in County Clare. The proposed development is located approximately 5km northwest of O'Briensbridge and 14km northeast of Limerick city.

1.2 Details of Proposed Works

The project primarily consists of a proposed wind farm site (the Site) of up to 8 no. wind turbine generators (WTG), a substation compound, grid connection route (GCR) and ancillary civil and electrical infrastructure.

The GCR will consist of a 38kV underground cable connecting the proposed Fahy Beg Wind Farm substation to the existing Ardnacrusha 110kV substation located approximately 10km southwest of the site.

The proposed wind farm site and grid connection includes lands in the townlands of Fahy More North, Ballymoloney, Ballykavin, Ballyquin More, Woodpark, Leitrim, Ballybrack, Fahy More South, Aharinaghmore, Tooreen, Aharinaghbeg, Knockdonagh, Roo East, Blackwater, Rosmadda West, Parkroe, Lackyle and Ballykeelaun.

An overview of the proposed project is presented in Figure 1.1 in Appendix 1.

1.3 Scope of Works and Proposed Objectives

Fehily Timoney and Company (FT) were engaged by RWE to undertake a geotechnical assessment of the proposed wind farm site with respect to slope stability.

This study is carried out in accordance with Eurocode 7: Part 2 (NSAI, 2007).

This report includes the following information:

- Site details including location, present use, proposed use etc.
- Site geology (bedrock, superficial deposits and made ground).
- Site hydrogeology.
- Site hydrology.
- Any site-specific requirements.
- A summary of the intrusive site investigations completed at the site.

This report includes the following interpretative elements:

- Interpretation of the findings of the site walkovers and intrusive ground investigations.
- Details of site constraints which may affect proposed site layout and engineering options.
- List of potential hazards at the site arranged into a Design Risk Register which will highlight any topographic, geological or man-made hazards in the area and potential mitigation measures to be taken during the next stages of the project.

2. DESK STUDY

Prior to undertaking the site walkover and intrusive ground investigations, a desk study was undertaken to provide relevant background information for the site. The desk study involved an examination of the following sources of information:

- OSI (2022), current and historic Ordnance Survey Ireland mapping and ortho-photography.
- Taluntais (1980), General Soil Map of Ireland.
- Geological Survey of Ireland (2022) GSI Public Data Viewer (www.spatial.dcenr.gov.ie).
- Environmental Protection Agency (2022) EPA online mapping (http://gis.epa.ie/Envision).
- Proposed layout of the development.

To determine the existing hydrogeological regime within the study area the following EPA and GSI online datasets and mapping from the sources outlined above were reviewed:

- Catchment & Management Units;
- Groundwater Bodies Status and Risk;
- Drinking Water Protection Areas;
- Groundwater Resources (Aquifers);
- Groundwater Wells and Springs;
- Karst Features; and
- Groundwater Vulnerability

2.1 Geology

2.1.1 Quaternary Deposits

The Quaternary deposits underlying the site and GCR is discussed below and presented in Figure 2.1.

The Quaternary deposits documented within the proposed development areas include:

- Till derived from Lower Palaeozoic sandstones and shales (TLPSsS),
- Bedrock outcrop or sub-crop (Rck),
- Gravels derived from Lower Palaeozoic and Devonian Sandstones (GLPDSs),
- Fen peat (FenPt),
- Till derived from Devonian Sandstones (TDSs), and
- Alluvium (A).

As shown in Figure 2.1 the majority of turbine locations and associated infrastructure are located within areas classified as Till derived from Lower Palaeozoic sandstones and shales with limited located within Gravels derived from Lower Palaeozoic and Devonian sandstones and bedrock sub-crop or outcrop.

The majority of the proposed grid connection route is underlain by Till derived from Devonian Sandstones with limited areas of bedrock sub-crop or outcrop, Till derived from Lower Palaeozoic sandstones and shales, Gravel derived from Lower Palaeozoic and Devonian sandstones and alluvium indicated along the proposed route.

During site walkovers area of shallow Peaty Topsoil deposits were noted across the site but these were generally very thin (0.1 to 0.2m thick) and were not considered to constitute Peat Deposits but rather a highly organic Topsoil with Peaty appearance.

The information above is taken from the Geological Survey of Ireland (GSI) online mapping - Quaternary Geology of Ireland (1:50,000 scale).

2.1.2 Solid Geology

The bedrock geology underlying the site and GCR is discussed below and presented in Figure 2.2.

The bedrock formations documented within the proposed development areas include:

- Carboniferous Lower Limestone Shale (LLS)
- Carboniferous Ballysteen Formation (BA)
- Carboniferous Waulsortian Limestones (WA)
- Upper Devonian Old Red Sandstone (ORS)
- Silurian The Broadford formation (BF)
- Silurian Cratloes Formation (CR)

The majority of the site is underlain by Old Red Sandstone which is described as red mudstones, siltstones and sandstones, and poorly sorted, polymict pebble conglomerates and breccia. The northern part of the site is underlain by Broadford formation, which is described as dominated by grey banded mudstones also containing abundant arenaceous horizons on the northern limb. On the southern limb of the Slieve Bernagh syncline, the formation is predominantly argillaceous in character (60% of outcrop). A fault line and unconformity exist between the two formations. The fault trends in an east-north-east to west-south-west direction.

The proposed grid connection route traverses the Old Red Sandstone Formation, as described above, at various sections of the route. The remainder of the route passes through (from north to south) Cratloes Formation, Lower Limestone Shale, Ballysteen Formation and Waulsortian Limestones (WA).

The information above is taken from the Geological Survey of Ireland (GSI) online mapping - 1:100,000 scale bedrock geology map.

2.2 Hydrogeology

2.2.1 Groundwater Vulnerability

The groundwater vulnerability within the site ranges from 'H – High' to 'X – rock at or near surface'. Along the proposed grid connection, the vulnerability classification ranges from 'Moderate' to 'Extreme' with localised areas of exposed bedrock (X).

The information above is taken from the Geological Survey of Ireland (GSI) online mapping – groundwater data viewer.

2.2.1 Groundwater Bodies Description

The site is located within three groundwater bodies namely the Lough Graney, Tulla-Newmarket-on-Fergus, and Broadford Gravels. The GRC is underlain predominant by the Lough Graney GWB, with the northern area of the route underlain by Broadford Gravels GWB and the southern area of the route underlain by Ardnacrusha GWB.

The information above is taken from the Geological Survey of Ireland (GSI) – Groundwater Body Description sheets.

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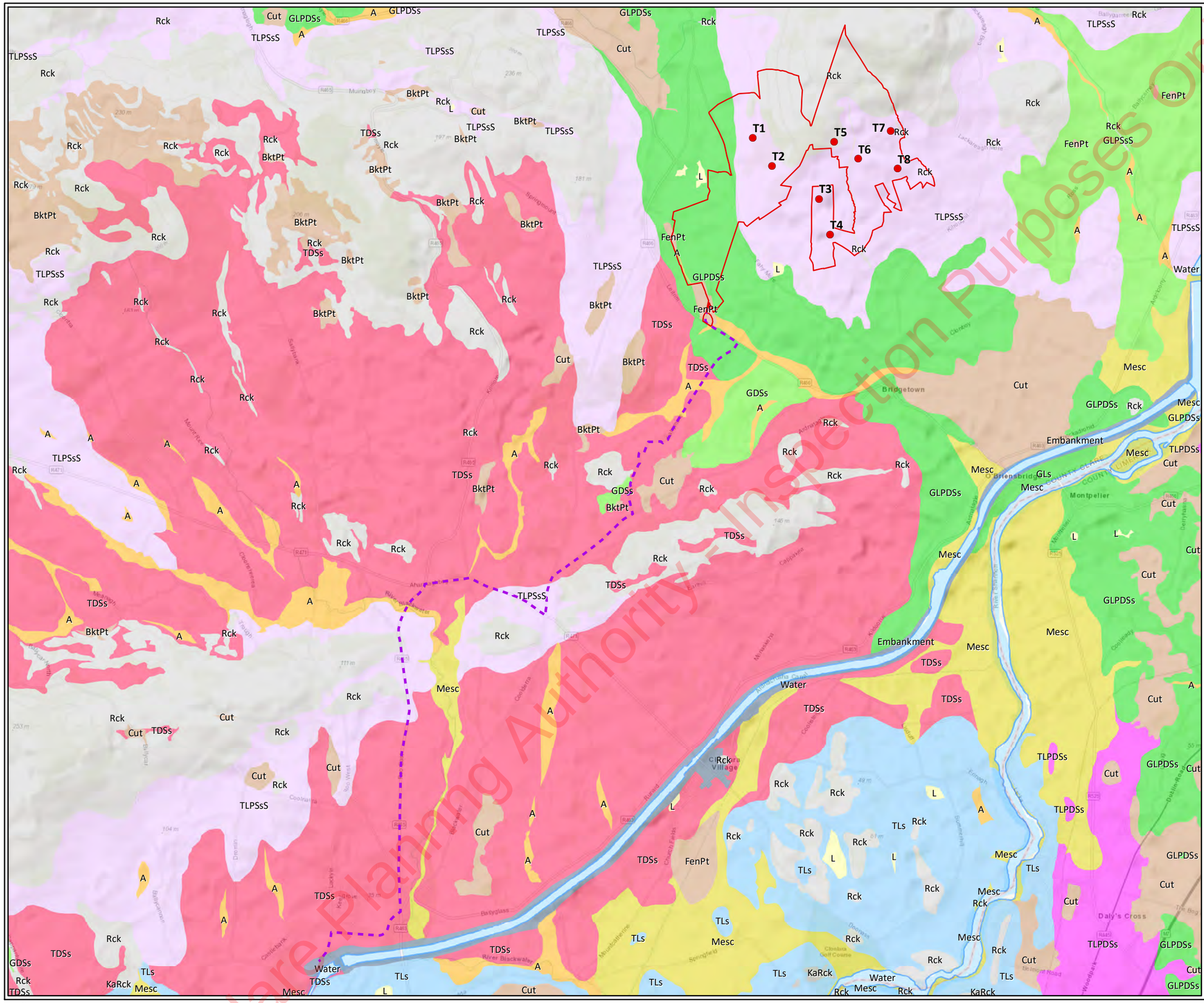

Legend

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

Quaternary Sediments:

- A, Alluvium
- BktPt, Blanket Peat
- Cut, Cut over raised peat
- Embankment
- FenPt, Fen Peat
- GDSs, Gravels derived from Devonian sandstones
- GLPDSs, Gravels derived from Lower Palaeozoic and Devonian sandstones
- GLPSsS, Gravels derived from Lower Palaeozoic sandstones and shales
- GLs, Gravels derived from Limestones
- KaRck, Kartsified bedrock outcrop or subcrop
- L, Lacustrine sediments
- Mesc, Esturine silts and clays
- Rck, Bedrock outcrop or subcrop
- TDSs, Till derived from Devonian sandstones
- TLPDSs, Till derived from Lower Palaeozoic and Devonian sandstones
- TLPSsS, Till derived from Lower Palaeozoic sandstones and shales
- TLs, Till derived from limestones
- Water

TITLE:	Quaternary Geology
PROJECT:	Fahy Beg Wind Farm, Co. Clare
FIGURE NO:	2.1
CLIENT:	RWE Renewables Ireland Ltd.
SCALE:	1:40000
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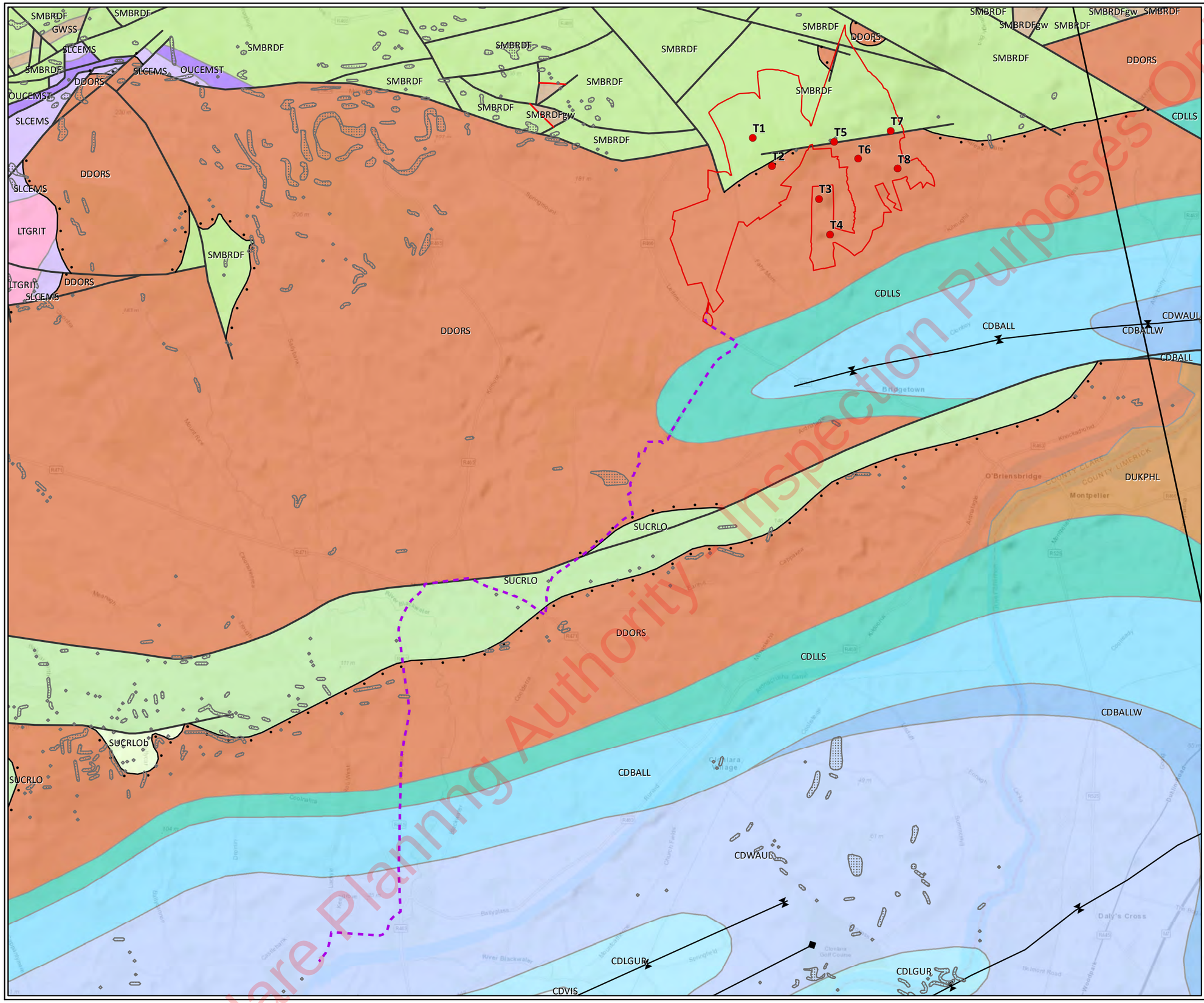

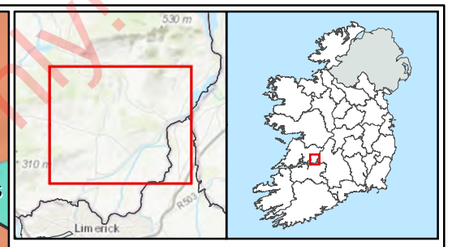

Legend

- Wind Farm Site
- Bedrock Outcrop
- Grid Connection Route
- Proposed Turbine Layout

Stratigraphic and Structural Linework:

- Anticlinal Axis
- Fault
- Synclinal Axis
- Thin stratigraphical unit, diagrammatic
- Unconformity, dots on younger side
- X-Section

Bedrock Geology:

- Ballysteen Formation
- Ballynash Member
- Lough Gur Formation
- Lower Limestone Shale
- Visean Limestones (undifferentiated
- Waulsortian Limestones
- Old Red Sandstone (undifferentiated
- Keeper Hill Formation
- in Broadford Formation
- in Cornagnoe Formation
- Ballymalone Formation
- Cornagnoe Formation
- Broadford Formation
- in Broadford Formation
- Cratloes Formation
- Ballycar South Member

TITLE:	Bedrock Geology		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	2.2		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:40000	**REVISION:**	0
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3. SITE WALKOVER

As part of the geotechnical assessment site walkovers were carried out by FT during August 2021 and June 2022. The objective of the site walkovers was to determine the baseline characteristics of the proposed wind farm site. This included the recording of salient geomorphological features with respect to the wind farm development. The method adopted for carrying out the site walkover relied on practitioners carrying out a visual assessment of the site supplemented with slope inclination measurement.

The survey covered the proposed locations for the turbine bases, substation, met mast, construction compounds, existing and proposed new access roads and all associated infrastructure.

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

3.1 General

As outlined above, site walkovers were carried out by FT during August 2021 and June 2022. The method adopted for carrying out the site walkovers relied on practitioners carrying out a visual assessment of the site supplemented with recording of slope inclinations.

The assessment included a series of hand-held probes and hand shear vanes at proposed infrastructure locations to determine the presence/depth of peat within the proposed development site. Visual observations were also made to assess the stability of other soil slopes and rock exposures across the site.

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

The slopes of the proposed development site are characterised by elevated lands with typical elevations of between 120m to 350m AOD.

Slopes at proposed turbine locations in the development range from 4 to 12 degrees.

Peaty Topsoil deposits were noted throughout the site, but these were generally very thin (0.1 to 0.2m thick) and were not considered to constitute Peat Deposits but rather a highly organic Topsoil with Peaty appearance.

No evidence of past failures or any signs of peat instability were noted on site.

No evidence of slope instability in other soil or rock slopes was observed at the site and there are no historical records of landslide activity within the site boundary or 5km of the site, on the GSI database.

The forested areas have been planted predominantly with conifers with some deciduous in other areas of the forestry plantations. Ground conditions within the forested areas typically comprise thin cover of soft organic Topsoil over Mineral Soil and Glacial Till.

From site walkovers completed by FT it was noted majority of existing access tracks on site have been constructed using a founded construction method based on observations made during site walkovers. The access tracks for the proposed development will comprise upgrading of existing founded access tracks and construction of new proposed access tracks using excavate and replace construction techniques.

A summary of the information obtained during the field assessments is provided below in Table 4.4.

4. GROUND INVESTIGATIONS

Intrusive ground investigations were undertaken by Irish Drilling Ltd (IDL) under the part-time supervision of an Engineering from FT in February, May, and July 2022.

The scope of the ground investigations is summarised below:

February 2022

- Advancement of 10 No. trial pits to a maximum depth of 3.0m below ground level (BGL) at proposed turbine locations and various infrastructure locations.
- Collection of samples for environmental and geotechnical testing.

May 2022

- Advancement of 5 No. trial pits to a maximum depth of 4.50m BGL at revised substation location.
- Collection of samples for environmental and geotechnical testing.

July 2022

- Advancement of 8 No. trial pits to a maximum depth of 4.50m BGL at revised substation locations.

The ground investigations were carried out in accordance with the principles in BS 5930:2015 and Eurocode 7 Part 2. A ground investigation location plan showing all trial pit locations is included as Figure 4.1 in Appendix 2 of this report.

4.1 Summary of Ground Conditions Encountered

The following section describes the ground conditions encountered during ground investigation completed at selected proposed turbine locations and the proposed substation locations.

4.1.1 Proposed Turbine Locations

Trial pits were excavated at all of the turbine locations. Geotechnical samples were collected from trial pits with the results described in Section 4.2 of this report. Refusal was recorded at 0.40m bgl for T3, 1.80m bgl for T6, 2.30m bgl for T4 & T7, 2.50m bgl for T2 & T8, 2.70m bgl for T5 and 3.00m bgl for T1. At T5 the rock was recorded as possible slate.

4.1.2 Proposed Substation Location

A total no. of 13 trial pits were dug around the 3 possible substation locations (5 at the first two substations and 3 at the third), to a maximum depth of 4.5m bgl. Geotechnical samples were collected from 5 of the 13 trial pits with the results described in Section 4.2.

4.2 Groundwater Encountered

Groundwater was recorded in multiple locations shown in Table 4.1 below.

Table 4.1: Summary of Groundwater Encountered

Borehole/Trial Pit ID	Groundwater Strike (m bgl)
TP-T001	1.80
TP-T003	Ground level to 1.0
TP-T004	1.80
TP-001	2.30
TP-002	3.40
TP-003	4.10
TP-004	1.40
TP08	3.90

4.3 Geotechnical Laboratory Testing

Following completion of intrusive site investigations by IDL laboratory testing was scheduled by FT. Soil testing was carried out in accordance with BS1377 (1990) – *Methods of Test for Soils for Civil Engineering Purposes* in their own designated 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. Chemical testing was also undertaken to determine Concrete Classification from the derived Sulphate Class for buried concrete.

The results are summarised in Table 4.2 & Table 4.3.

Table 4.2: Laboratory Testing (Feb 2020)

Type	N	Min	Max	Remarks
Natural Moisture Content (%)	3	13	34	-
Particle Size Distribution	8			Typically described as Brown silty clayey very sandy GRAVEL with occasional fine rootlets & Brown slightly sandy gravelly silty CLAY
Hydrometer	3			-
Water soluble sulphate (2:1 water/soil extract)	3	0.021	0.032	-
pH	3	7.82	7.85	-

Table 4.3: Laboratory Testing (May 2022)

Type	N	Min	Max	Remarks
Natural Moisture Content (%)	5	17	47	-
Atterberg Limits	3			Liquid Limit, LL 31% to 44% Plastic Limit, PL 22% to 26% Plasticity Index, PI 9% to 18%
Particle Size Distribution	4			Typically described as Brown sandy SILT & Brown silty SAND.
Hydrometer	3			-
Organic Content	1			Only one test carried out. Result – 0.795
Water soluble sulphate (2:1 water/soil extract)	3	0.0069	0.0279	-
pH	4	7.76	8.65	-

Table 4.4: Site Walkover Summary

Proposed Infrastructure	Exploratory Hole ID	Land Use (Site Walkover)	Slope (Site Walkover)	Average Peat Depth (m)	Quaternary Deposits (GSI Online Mapping)	Bedrock Geology (GSI Online Mapping)	Groundwater Vulnerability (GSI Online Mapping)	Ground Conditions (Intrusive Investigation)	Depth to Expected Bedrock (Intrusive Investigation)	Depth to Groundwater (Intrusive Investigation)
T01	TP-T001	Agriculture	8	0	Till derived from Lower Palaeozoic sandstones and shales	Broadford Formation	H – High	Topsoil over firm Silt and weathered bedrock	3.00	1.80
T02	TP-T002	Agriculture	8	0	Till derived from Lower Palaeozoic sandstones and shales	Old Red Sandstone	H – High	Firm Silt over sandy Gravel and weathered bedrock	2.50	-
T03	TP-T005	Forestry	12	0	Bedrock outcrop or sub-crop	Broadford Formation	X – Rock at or near surface	Topsoil over possible bedrock	0.40	-
T04	TP-T007	Forestry	7	0	Till derived from Lower Palaeozoic sandstones and shales	Broadford Formation	E – Extreme	Firm gravelly Silt over very sandy Gravel over gravelly Clay	2.30	-
T05	TP-T006	Forestry	6	0	Till derived from Lower Palaeozoic sandstones and shales	Old Red Sandstone	H – High	Topsoil over gravelly Silt over silty Clay over sandy Gravel	2.70	-
T06	TP-T008	Agriculture	5	0	Till derived from Lower Palaeozoic sandstones and shales	Old Red Sandstone	H – High	Firm Silt over very sandy Gravel over Cobles and Boulders	1.80	-

Proposed Infrastructure	Exploratory Hole ID	Land Use (Site Walkover)	Slope (Site Walkover)	Average Peat Depth (m)	Quaternary Deposits (GSI Online Mapping)	Bedrock Geology (GSI Online Mapping)	Groundwater Vulnerability (GSI Online Mapping)	Ground Conditions (Intrusive Investigation)	Depth to Expected Bedrock (Intrusive Investigation)	Depth to Groundwater (Intrusive Investigation)
T07	TP-T004	Agriculture	4	0	Till derived from Lower Palaeozoic sandstones and shales	Old Red Sandstone	H – High	Topsoil over gravelly Silt over very sandy Gravel	2.30	1.80
T08	TP-T003	Agriculture	6	0	Till derived from Lower Palaeozoic sandstones and shales	Old Red Sandstone	H – High	Topsoil over firm Silt over stiff gravelly Silt/Clay	2.50	g/l to 1.00
Construction Compound	TP-C1	Overgrown area in Quarry	3	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Very soft organic silty Clay	-	1.50
Construction Compound	TP-S2	Overgrown area in Quarry	3	0	Fen Peat Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Very soft silty Clay over Boulders and Cobbles	-	1.70
Possible Substation (1)	TP-001	Overgrown area in Quarry	3	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Fine Sand over sandy silty Clay	-	2.30
Possible Substation (1)	TP-002	Overgrown area in Quarry	3	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Fine Sandy over clayey Silt	-	3.40

Proposed Infrastructure	Exploratory Hole ID	Land Use (Site Walkover)	Slope (Site Walkover)	Average Peat Depth (m)	Quaternary Deposits (GSI Online Mapping)	Bedrock Geology (GSI Online Mapping)	Groundwater Vulnerability (GSI Online Mapping)	Ground Conditions (Intrusive Investigation)	Depth to Expected Bedrock (Intrusive Investigation)	Depth to Groundwater (Intrusive Investigation)
Possible Substation (1)	TP-003	Overgrown area in Quarry	3	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Firm Clay with rootlets over very soft Clay	-	4.10
Possible Substation (1)	TP-004	Overgrown area in Quarry	3	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Fine Sand with layer of soft Clay	-	1.40
Possible Substation (1)	TP-005	Overgrown area in Quarry	3	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Fine Sand with layer of soft Clay	-	-
Possible Substation (2)	TP01	Agriculture	6 – 16	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Topsoil over gravelly Sand	-	-
Possible Substation (2)	TP02	Agriculture	6 – 16	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Topsoil over clayey Sand over gravelly Sand	-	-
Possible Substation (2)	TP03	Agriculture	6 - 16	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Topsoil over gravelly Sand over Cobbles and Boulders	-	-

Proposed Infrastructure	Exploratory Hole ID	Land Use (Site Walkover)	Slope (Site Walkover)	Average Peat Depth (m)	Quaternary Deposits (GSI Online Mapping)	Bedrock Geology (GSI Online Mapping)	Groundwater Vulnerability (GSI Online Mapping)	Ground Conditions (Intrusive Investigation)	Depth to Expected Bedrock (Intrusive Investigation)	Depth to Groundwater (Intrusive Investigation)
Possible Substation (2)	TP04	Agriculture	6 – 16	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Topsoil over gravelly Sand	-	-
Possible Substation (2)	TP05	Agriculture	6 – 16	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Topsoil over clayey gravelly Sand	-	-
Possible Substation (3)	TP06	Overgrown area in Quarry	3	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Gravelly Sand	-	-
Possible Substation (3)	TP07	Overgrown area in Quarry	3	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Sand and Gravel over gravelly Sand	-	-
Possible Substation (3)	TP08	Overgrown area in Quarry	3	0	Gravels derived from Lower Palaeozoic and Devonian sandstones	Old Red Sandstone	H – High	Topsoil over sandy Gravel over gravelly Sand	-	3.90

5. GROUND MODEL

The site walkover and ground investigations have generally confirmed the anticipated geology described in the Desk Study. A summary of the geological strata encountered during the ground investigations is summarised in Table 5.1 and Table 5.2 below.

Table 5.1: Summary of Geology Encountered at Turbine Locations

Strata	General Description	Depth to Top Range (m bgl)	Depth to Bottom Range (m bgl)
Topsoil	Firm grey slightly sandy gravelly SILT - TOPSOIL with rootlets	0.00	0.20 – 0.50
Glacial Till	Firm to stiff grey gravelly sandy SILT/CLAY	0.00 – 1.50	1.00 - 3.00
Gravel	Brown silty clayey very sandy GRAVEL with low boulder content	0.50 – 2.10	1.00 - 2.70
Weathered Bedrock	Recovered as flat and angular sandstone clasts with orange sandy gravel infill	0.2 - 1.0	0.4 - 2.5
Bedrock	Possible Slate rock	0.4 - 3.00	N/A

Table 5.2: Summary of Geology Encountered at Substation Locations

Strata	General Description	Depth to Top Range (m bgl)	Depth to Bottom Range (m bgl)
Made Ground	Soft wet greyish brown sandy SILT/CLAY	0.00	0.60 – 4.50
Topsoil	Firm brown slightly sandy CLAY	0.00	0.25 – 0.40
Gravel	Brown very sandy GRAVEL	0.25	0.60
Sand	Brown/orange clayey gravelly SAND	0.00 – 1.30	0.90 - 4.50
Glacial Till	Reddish slightly gravelly sandy CLAY	0.90	1.30
Cobbles & Boulders	Cobbles and Boulders (sub-angular)	3.30	3.50
Bedrock	Extracted boulders described as SILTSTONE with iron staining. Also described as probable SANDSTONE bedrock.	3.50 – 4.10	N/A

6. SLOPE STABILITY ASSESSMENT

6.1 Factors Controlling the Stability of Slopes

The factors controlling the stability of slopes are:

- Slope geometry
- Geology
- Properties of the slope material
- Groundwater levels
- Surcharge.

From a review of the GSI Landslide Susceptibility database the proposed development and proposed infrastructure locations are generally located within areas of 'Low' and 'Moderately High' susceptibility.

Slopes at these proposed turbine locations were recorded during site walkover to be moderate/steep with maximum slope angles of 12 degrees at turbine T05. This location was selected for slope stability assessment in accordance with the principles of Eurocode 7 (IS EN 1997-1).

6.2 Eurocode 7 and Partial Factors

In accordance with the principles of Eurocode 7 (IS EN 1997-1), rather than using a global factor of safety as per previous design codes, the factors of safety (termed partial factors) are applied to the chosen characteristic values to obtain design values. Actions (influences) are multiplied by the safety factor, while resistances are divided by the safety factor.

In accordance with Eurocode 7 (IS EN 1997-1), geotechnical checks must be carried out to ensure that the resistance preventing a slide are greater than or equal to the actions which cause a slide, i.e.:

$$E_d <= R_d$$

Where:

E_d = Sum of design actions
R_d = Sum of design resistances

By adopting the methods of analysis given in Eurocode 7 (IS EN 1997-1), the factor of safety against failure is ***included*** in the partial factors (ranging from 1.0 to 1.3 for various parameters) applied to the analysis rather than to the end result. In order to verify that this condition is met, the resulting "safety ratio" must be equal or greater than 1.0 in order to verify that the above condition is met. i.e.: An in-situ "safety ratio" of less than 1.0 indicates that the slope currently has an inadequate factor of safety against failure and therefore is potentially unstable. Ratios greater than 1.0 indicate an adequate factor of safety against failure and are considered stable in both short and long term.

Table 6.1: Partial Factors used to Derive Design Parameters

Partial Factor		Parameter
$\gamma_{c'}$	1.25	Effective cohesion
$\gamma_{\phi'}$	1.25	Effective angle of friction
γ_{γ}	1	Soil density
γ_{Q}	1.3	Loading (unfavourable)
$\gamma_{R;e}$	1	Earth resistance

Table 6.1 shows the partial factors which have been applied to the characteristic values to give the derived parameters in Table 6.2 and 6.3 used during the slope stability analyses. The design parameter is derived by multiplying or dividing the characteristic values by the associated partial factor, i.e. tan 15(ϕ') / 1.25($\gamma_{\phi'}$) = 12.1°.

6.3 Slope Stability Analysis Method

Slope/W software of Geo Studio International was used to assess the stability of proposed slopes at turbine locations T02 & T03. Slope/W is a general software tool for the slope stability analysis of earth structures.

It uses the limit equilibrium method of analysis by using the idea of dissecting a potential sliding mass into vertical slices. It assesses the factor of safety for both moment and force equilibrium based on various methods, including Bishop, Janbu and Morgenstern-Price.

Using this software, it is possible to deal with complex stratigraphy, highly irregular pore-water pressure conditions, a variety of linear and nonlinear shear strength models, virtually any kind of slip surface shape, concentrated loads and pressure lines. Limit equilibrium formulations based on the method of slices are also being applied more and more to the stability analysis of structures such as tieback walls, nail or fabric reinforced slopes, and even the sliding stability of structures subjected to high horizontal loading arising.

Traditionally, the factor of safety is defined as that factor by which the shear strength of the soil must be reduced in order to bring the mass of soil into a state of limiting equilibrium along a selected slip surface. The results of the analysis show the overall stability of the embankment expressed as a factor of safety.

The definition of factor of safety used within SLOPE/W is:

$$F = \frac{\text{Available restoring moment (or forces)}}{\text{Total disturbing moment (or forces)}}$$

Design values for use in the slope stability analysis have been derived using Eurocode 7 (IS EN 1997-1) Design Approach 1 Combination 2. This design approach is considered to be the most logical approach for slope stability analysis as it includes partial factors for both material properties and variable loads (for example traffic loads).

6.4 Limitations of Slope Stability Analysis

The application of traditional stability analysis such as this can be misleading as they assume a circular slip surface is the ultimate limit state. In reality, the ultimate limit state is likely to be non-circular in nature and as such these models may not be strictly modelling the critical limit state. Slope/W allows for some optimization of the slip surface within its analysis which reduces this limitation to some extent.

Despite the limitations outlined above, this method of slope analysis is still considered to provide a conservative analysis of the ultimate limit state and its use is in accordance with current industry best practice.

6.5 Material Properties

Table 6.2 below shows the typical parameters used for the Glacial Till and bedrock encountered beneath the turbine locations T02 & T03.

Table 6.2: Characteristic Parameters for Materials

Material	Glacial Till (Cohesive)	Granular Fill (Class 1)	Gravel	Bedrock (Weathered)
Cohesion, c', kN/m^2	0	0	0	100
Effective Friction angle, ϕ',	30	38	30	30
Bulk unit weight, γ, kN/m^3	21	21	20	21
Undrained Cohesion c_u, kN/m^2	75	-	-	-

6.6 Loading

A modelled loading of $250kN/m^2$ was conservatively applied to the slopes during the analyses to simulate an Outrigger Pad either side of the lifting crane on the slopes. These Outrigger pads were placed a minimum of 2.5m from the slope edge. The distance between each Outrigger was assumed to be 3.0m.

For the purposes of the slope stability modelling all shallow soft deposits have been removed from the proposed location of the turbine foundation.

6.7 Slope Stability Analysis Models

A Slope/W model has been presented to reflect the proposed slopes at the turbine locations as outlined below:

- Model 1 - Turbine T02
- Model 2 – Turbine T03

The results of this analysis are summarised in Table 6.4 with safety ratios calculated for the Bishop method.

6.8 Slope Stability Analysis Results

The lowest safety ratio for potential slope failures (Table 6.4) was 1.027. Analyses were undertaken for both deep-seated (rotational) type slips and shallow (translational) type although the shallow translations failures within the overburden deposits gave the lower safety ratios.

Table 6.3: Slope Analysis results

Model Name	Location	FoS – Drained	FoS - Undrained
1	T02	1.041	1.027
2	T03	3.105	2.456

The safety ratio for potential slope failure for drained conditions was 1.041 at proposed turbine location T02. By adopting the methods of analysis given in IS EN 1997-1, the factor of safety (FoS) against failure is included in the partial factors applied to the analysis rather than to the end result. A safety ratio of greater than 1.0 indicates that the slope is considered stable in the long-term drained conditions.

In order to maintain the safety of the slopes during the foundation and hardstands excavation works and associated cut and fill activities groundwater and surface water drainage should be maintained to mitigate the potential instability of the slopes. It is also recommended that surcharging loads i.e. construction traffic is limited to 10 kN/m^2 and a 0.5m exclusion zone from the edge of the crest of constructed slopes is maintained to prevent surface failures or shoulder failure at the crest of the slope.

In addition, it is recommended that the slopes are inspected after extended periods of heavy rain for any signs of instability such as tension cracks at the top of the slopes or bulging near the toe of slopes.

7. GEOTECHNICAL CONSIDERATIONS

7.1 Turbine Foundations

Based on the findings of the site investigations undertaken to date, a preliminary assessment of the likely foundation types found that a gravity foundation construction (founded) would be suitable for all of the proposed turbine foundations.

At the underside of the turbine foundation, a layer of structural up-fill (class 6N/6P - in accordance with TII requirements) will be required.

It should be noted that at detailed design stage a confirmatory ground investigation will be carried out at each proposed turbine locations to confirm the turbine foundation type. The ground investigation will be in the form of a borehole with in-situ SPT testing at 1.0m intervals in the overburden and follow-on rotary core through bedrock.

A summary of turbine foundation types estimated depth and founding stratum is provided below in Table 7.1.

Table 7.1: Turbine Foundation Summary

Proposed Infrastructure	Quaternary Deposits (GSI)	Ground Conditions Encountered	Slope (degrees)	Depth to Bedrock	Foundation Recommendation
T01	Till derived from Lower Palaeozoic sandstones and shales	Topsoil over firm Silt and weathered bedrock	8	3.00	Gravity foundation up to 3.0m bgl.
T02	Till derived from Lower Palaeozoic sandstones and shales	Firm Silt over sandy Gravel and weathered bedrock	8	2.50	Gravity foundation up to 3.0m bgl
T03	Bedrock outcrop or subcrop	Topsoil over possible bedrock	12	0.40	Gravity foundation up to 3.0m bgl
T04	Till derived from Lower Palaeozoic sandstones and shales	Firm gravelly Silt over very sandy Gravel over gravelly Clay	7	2.30	Gravity foundation up to 3.0m bgl
T05	Till derived from Lower Palaeozoic sandstones and shales	Topsoil over gravelly Silt over silty Clay over sandy Gravel	6	2.70	Gravity foundation up to 3.0m bgl
T06	Till derived from Lower Palaeozoic sandstones and shales	Firm Silt over very sandy Gravel over Cobles and Boulders	5	1.80	Gravity foundation up to 3.0m bgl
T07	Till derived from Lower Palaeozoic sandstones and shales	Topsoil over gravelly Silt over very sandy Gravel	4	2.30	Gravity foundation up to 3.0m bgl
T08	Till derived from Lower Palaeozoic sandstones and shales	Topsoil over firm Silt over stiff gravelly Silt/Clay	6	2.50	Gravity foundation up to 3.0m bgl

7.2 Access Tracks

It is considered all newly constructed access road will be of the founded type. Existing access road infrastructure will be incorporated into the design or improved upon through the use of widening and strengthening.

Founded roads are used in areas where competent ground is encountered at shallow depth. These roads are constructed by excavating until competent strata is encountered and then filling with a compacted 6F2 granular fill to road level. A layer of Class 804 material (in accordance with 800 series of the Specification for Road Works) is then used as a surfacing layer.

Tracks shall be observed during earthworks operations, if excessive rutting occurs, the pavement depth shall be increased.

Stone fill of suitable Class 6F2 material will be placed and compacted in accordance with the TII Specification for Road Works.

Where bearing stratum has slope greater than 1:1.5, benching should be carried out. Benches to be 0.5m Vertical & 1.0m Horizontal, with maximum crossfall of 2% on Horizontal section.

7.3 Crane Hardstands

Crane hardstands will all be founded. Crane hardstands are generally 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 founding levels for the hardstands may be variable across the site and will be determined during confirmatory ground investigation/detailed design stage.

The typical make-up of the hardstands would include up to 1.0m of compacted Class 1/6F material with geotextile and/or geogrid layers incorporated as required during detailed design stage.

7.4 Substation Foundations and Platforms

The substation platforms will be constructed using the founded 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 generally constructed using compacted Class 1/6F material with a suitable sub-formation to achieve the required bearing resistance.

Given the ground conditions present at the proposed substations, it is envisaged that the foundations will require to be founded on Glacial Till deposits. The typical make-up of the substation platform may include up to 750mm of granular stone fill 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) will likely be required.

7.5 Temporary Construction Compound Platforms

The construction compound platforms will be constructed using founded techniques. 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 typical make-up of the construction compound platform would include up to 500mm compacted Class 1/6F material with a suitable sub-formation to achieve the required bearing resistance. Geotextile and/or geogrid layers will be incorporated as required during detailed design stage.

8. CONCLUSIONS AND RECOMMENDATIONS

Fehily Timoney & Company (FT) were retained by RWE Renewables Ireland Ltd. to undertake a geotechnical site assessment at the proposed Fahy Beg Wind Farm located in County Clare.

The slopes of the proposed development site are characterised by elevated lands with typical elevations of between 120m to 350m AOD.

A review of the published GSI datasets for the site indicated that the majority of turbine locations and associated infrastructure are located within areas classified as Till derived from Lower Palaeozoic sandstones and shales with limited areas located within Gravels derived from Lower Palaeozoic and Devonian sandstones and bedrock sub-crop or outcrop. The findings of the intrusive site investigations confirm the geological profiles outlined by the GSI mapping and datasets.

Maximum slope angles of 12 degrees at turbine T03 were recorded. This location has the proposed largest cut within the development and therefore was selected for slope stability assessment. T02 has the largest fill within the development and was also selected for slope stability assessment. A safety ratio for potential slope failures for drained conditions of 3.105 and 1.041 at proposed turbine locations T03 and T02, respectively. A safety ratio of greater than 1.0 indicates that the slope is considered stable in the long-term drained conditions.

Despite the development site having an acceptable margin of safety with respect to slope stability a number of mitigation/control measures are proposed to ensure that all works adhere to an acceptable standard of safety for work in upland site conditions. Mitigation/control measures identified for each of the infrastructure elements in the risk assessment should be taken into account and implemented throughout design and construction works.

There is a risk of water ingress during excavation for the footings above the level of bedrock at the site. As such, provisions should be made for sump pumping should water ingress occur. Should foundations be required to advance below bedrock dewatering infrastructure should be considered prior to construction commencing.

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

APPENDIX 1

Slope Stability Assessment

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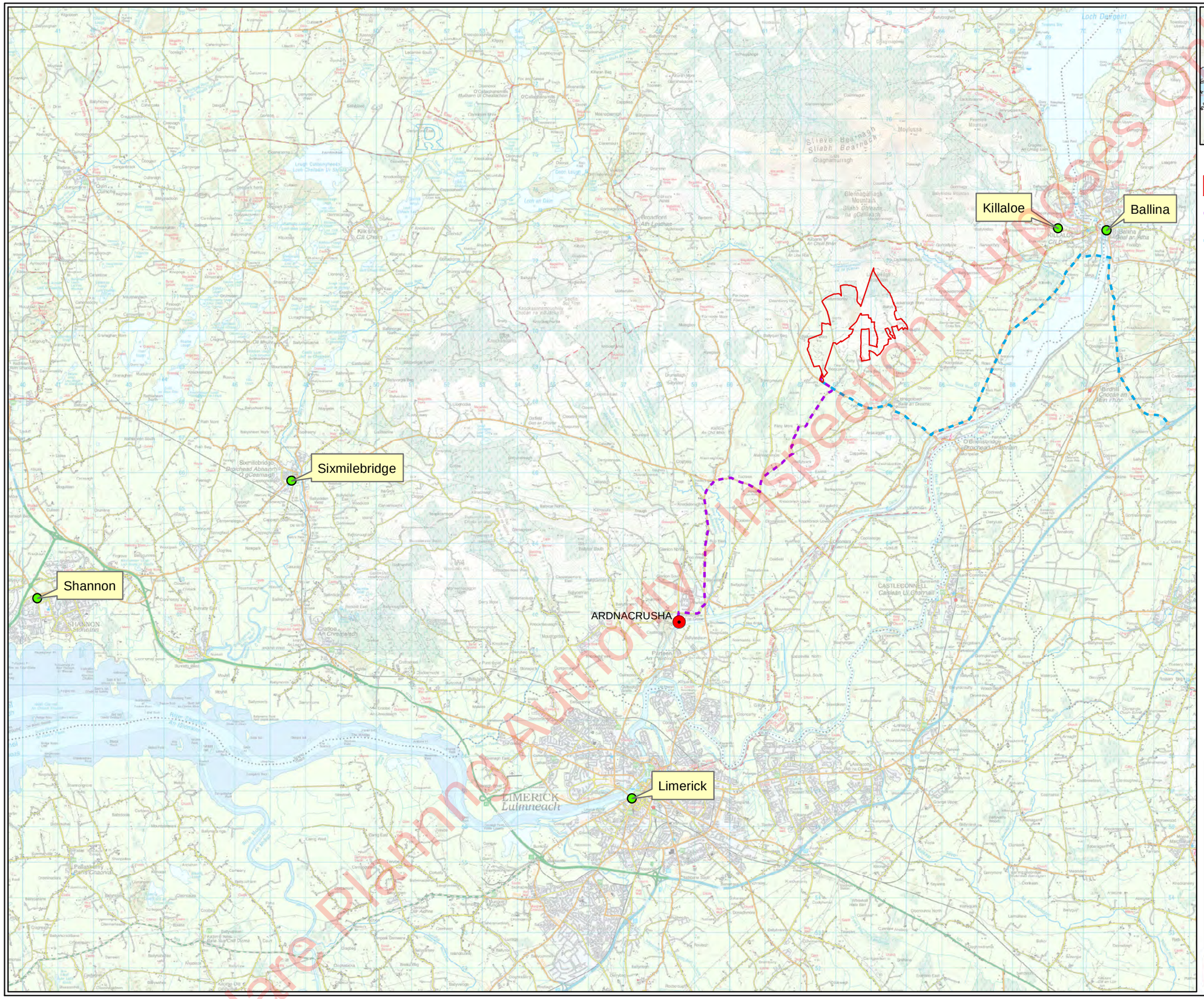

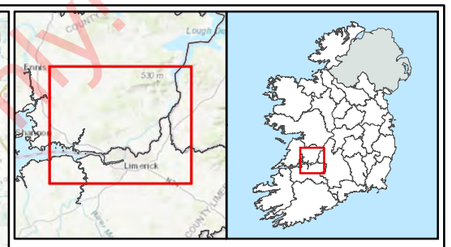

Legend

- Wind Farm Site
- Grid Connection Route
- Turbine Delivery Route
- Ardnacrusha Substation (110kV)

N W E S

0 2 4 8 Kilometers

TITLE: General Site Overview			
PROJECT: Fahy Beg Wind Farm, Co. Clare			
FIGURE NO:	1.1		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:105000	**REVISION:**	0
DATE:	12/07/2022	**PAGE SIZE:**	A3

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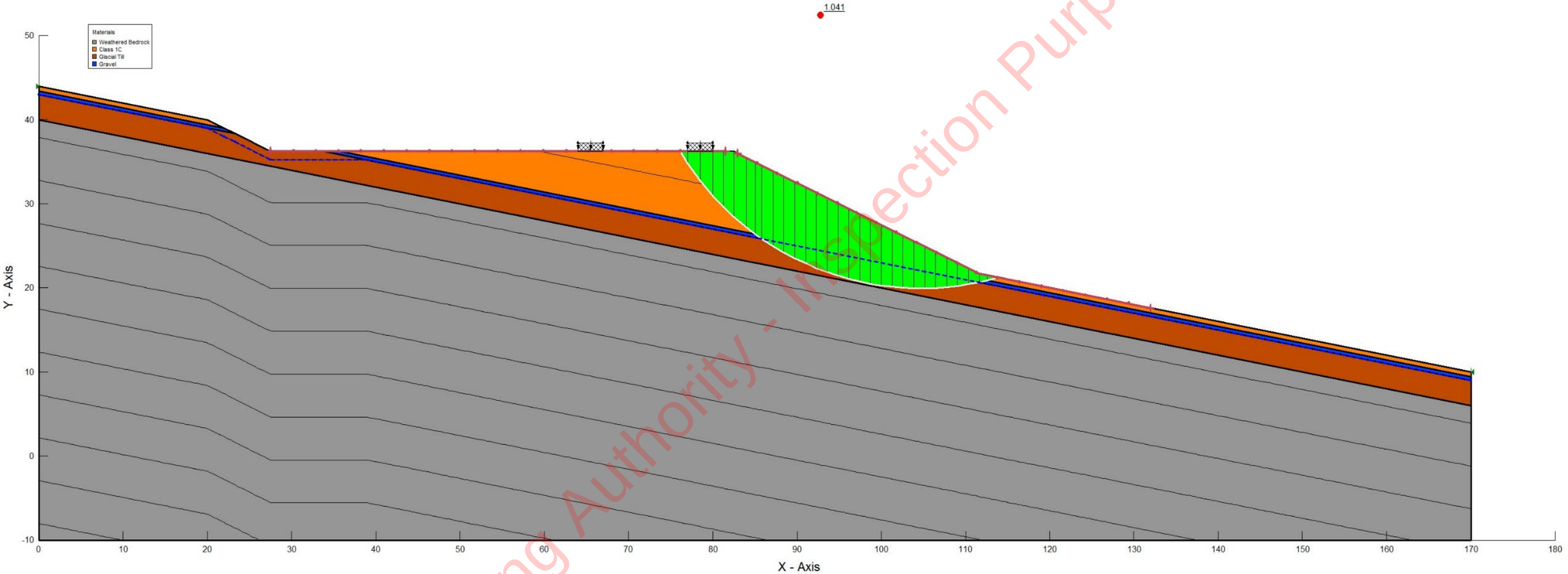

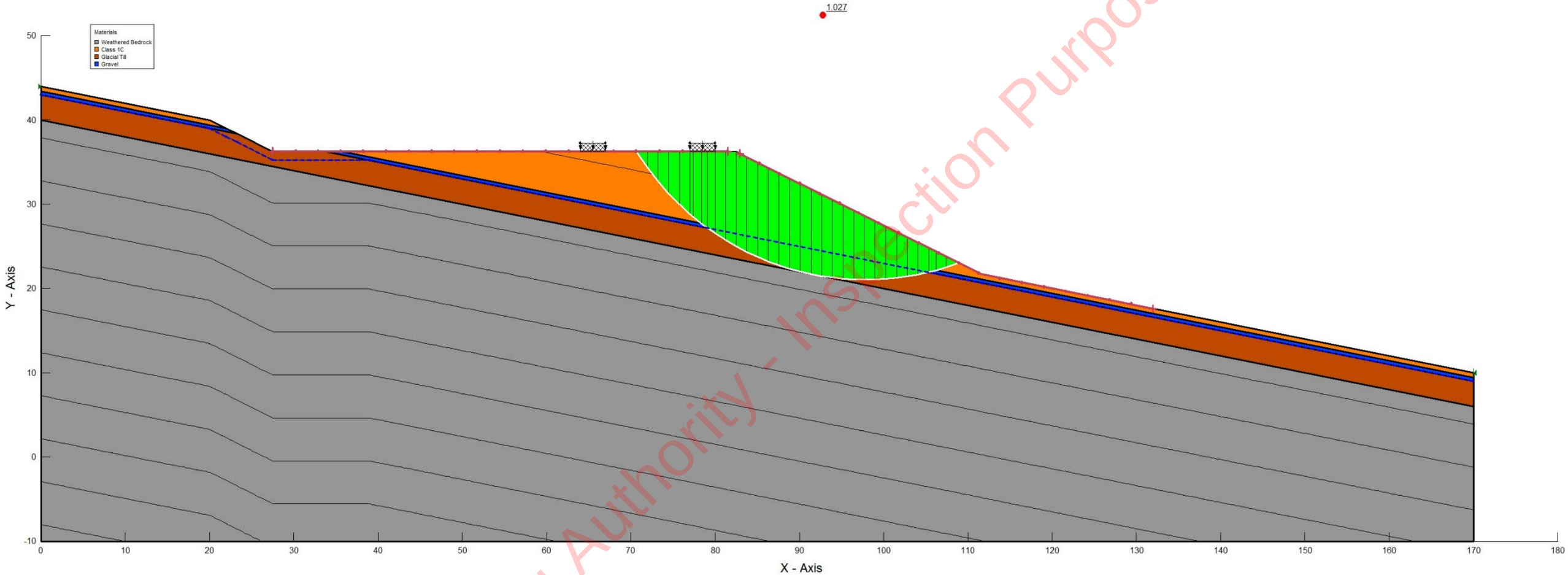

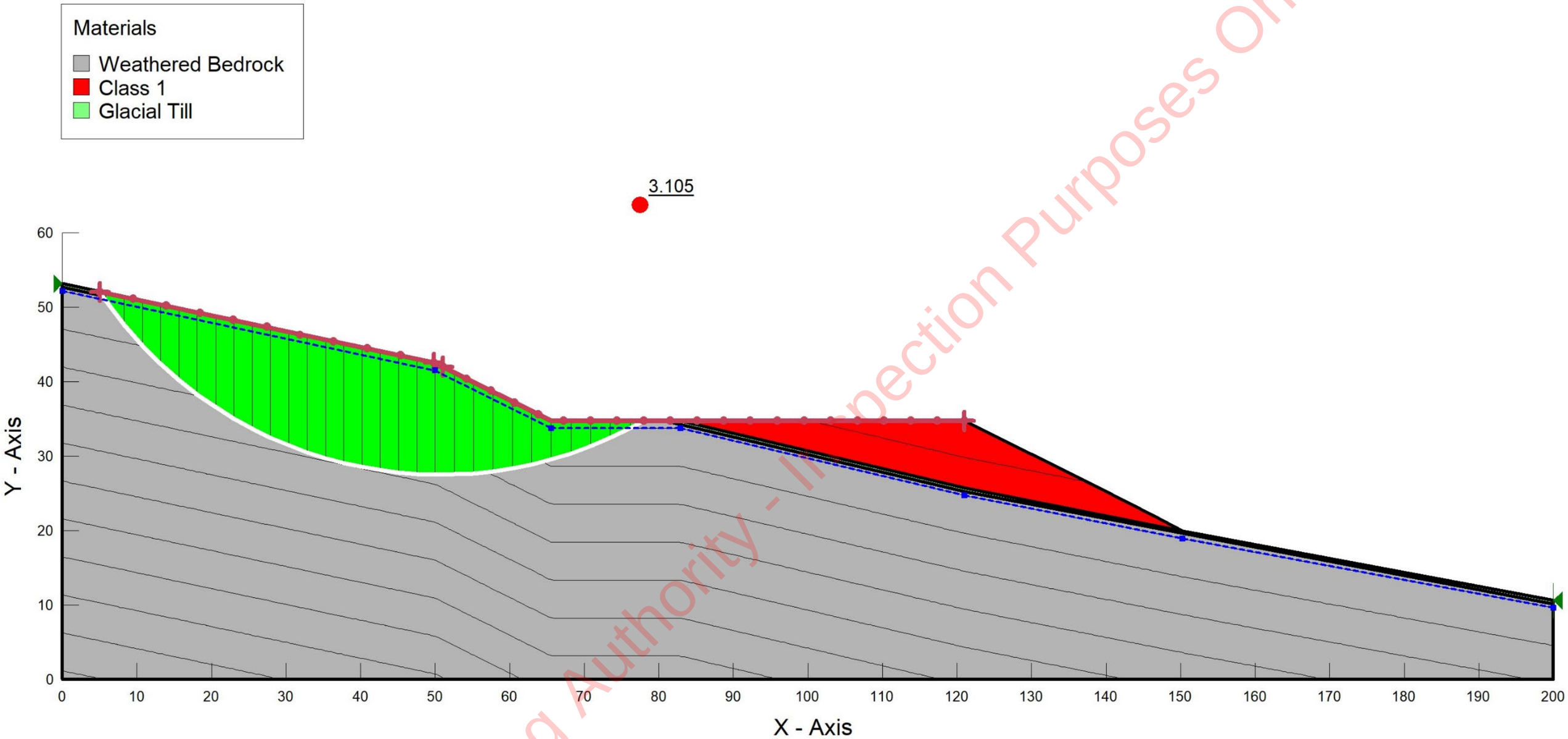

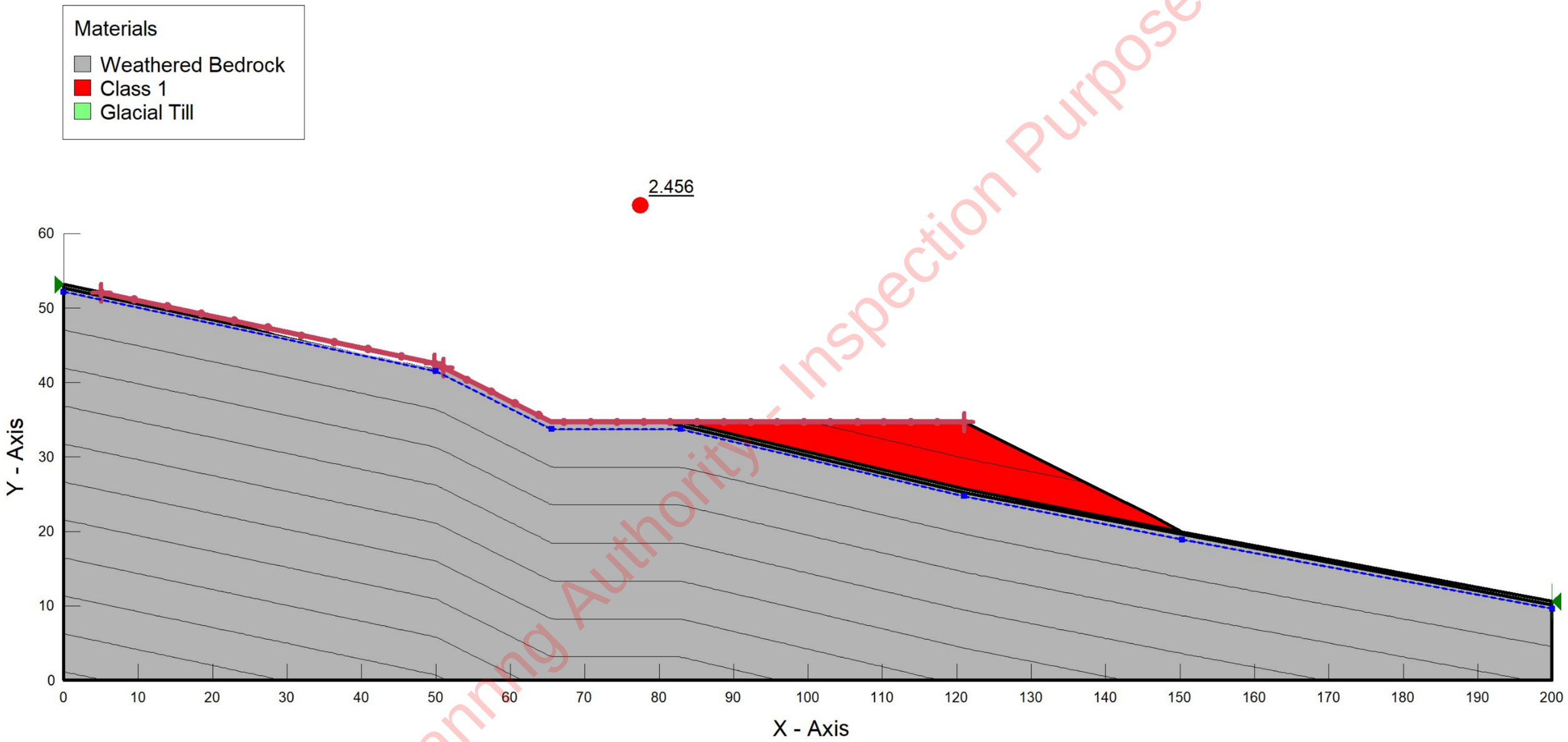

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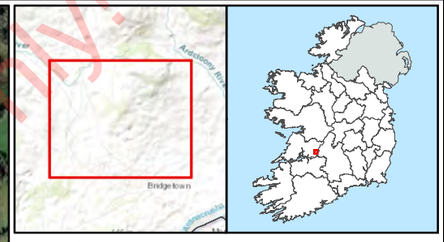
APPENDIX 2

Site Investigation Plan & Ground Investigation Factual Report

Path: R:\Map Production\2020\P20-003\Workspace\EIAR\P20-003_GIS_Fig4-1_GroundInvestigationLocationPlan_A3.mxd



Legend

- Wind Farm Site
- Grid Connection Route
- Proposed Turbine Layout
- Trial Pits

TITLE:	Ground Investigation Location Plan		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	4.1		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:14000	**REVISION:**	0
DATE:	12/07/2022	**PAGE SIZE:**	A3

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FAHY BEG WIND FARM

SITE INVESTIGATION CONTRACT FACTUAL REPORT

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45141,
Essen.

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

	Prepared by	Approved by	Rev. Issue Date:	Revision No.
	Ronan Killeen	Declan Joyce	8th August 2022	21 _CE_102/03
Signature				

FOREWORD

The 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 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 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 & Partners, Consulting Engineers, on behalf of RWE Ireland, to carry out a site investigation at the site of the proposed Fahey Beg Wind Farm Project.

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

Phase 1 fieldwork commenced on February 3rd 2022 and was completed on February 7th 2022.

Phase 2 fieldwork was carried out on May 13th 2022.

2.0 Site & Geology

The site is located southwest of Killaloe, County Clare.

The site is agricultural in nature and the fieldwork was carried out predominantly on agricultural lands.

Weather conditions in general were quite variable with the majority of the fieldwork carried out over a typical winter period in Ireland.

Geological Survey maps of the area indicate that the site is underlain by Limestone and Sandstone Rock Formations.

A Site Plan, prepared by the client's representatives to show approximate fieldwork locations, is included with this report.

3.0 Fieldwork.

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

Phase 1 Fieldwork:

1nr Kobelco 7T Tracked Excavator.

Fieldwork carried out to date has included the following:

Ten 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.

The pits were excavated to depths ranging from 0.40m to 3.00m below ground level.

Phase 2 Fieldwork:

1nr Hitachi 13T Tracked Excavator.

Fieldwork carried out to date has included the following:

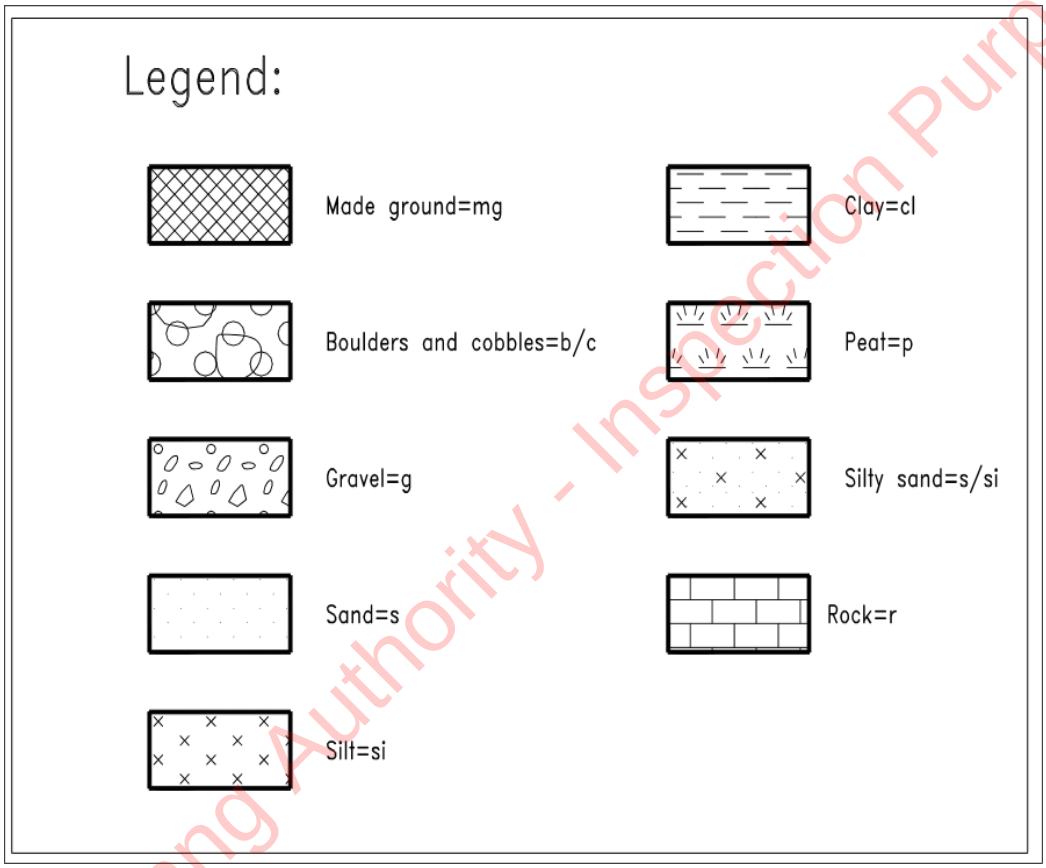
Five trial pits were excavated on site using a tracked excavator.

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.

The pits were excavated to depths ranging from 2.30m to 3.40m below ground level.

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 bedrock.

The Glacial Tills in general consisted of grey and brown slightly gravelly sandy silt with cobbles and boulders and/or silty clayey sandy gravel with cobbles and boulders.

Possible weathered bedrock was also encountered at trial pit T005 while a number of trial pits encountered 'refusal' on possible bedrock at relatively shallow depths.

Phase 2 fieldwork operations encountered possible made ground to depths of up to 3.40m and predominantly consisted of silty sands interbedded with silt/clay. It is possible that the area where the trial pits were excavated was previously used as a settlement pond for an adjacent quarry.

For detailed descriptions of the ground conditions encountered please refer to the engineering logs included as Appendix 1 and Appendix 1a of this report.

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 fieldwork 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.

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 Representative and included some or all of the following tests on disturbed soil samples:

* Moisture Content.
* Atterberg Limits.
* Particle Size Distribution.
* Sedimentation.
* Chemical (pH, Sulphate).
* Organic Content.

The records of these laboratory tests results are included as Appendix 2 and Appendix 2a of this factual report.

The soil descriptions as noted on the 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
Chartered Engineer
Irish Drilling Limited
July 19th 2022

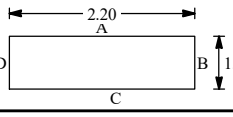
Appendix 01
Trial Pit Records

PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-C1
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,569.6 N 668,946.8
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 48.96m O.D.	**DATE:** 3.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.50m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 1.10 * 2.20m
LOGGED BY: MM



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									Reeds over very soft wet slightly sandy organic silty CLAY. Sand is fine.
1			B 1	1.00					
		1					47.46	1.50	Fast water inflow from base of pit at 1.50m depth.
						END			TP terminated at 1.50m bgl. Unable to progress TP - sidewall collapse.
2									
3									
4									
5									

Remarks: Ingress of water at 1.50m bgl. TP backfilled with arisings.

Scale: 1:25

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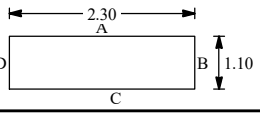
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-S1
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,539.6 N 668,774.4
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 45.19m O.D.	**DATE:** 3.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.70m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 1.10 * 2.30m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									Reeds over very soft wet grey silty CLAY.
			B 1	1.70-2.20			43.49	1.70	Wet rounded to subrounded BOULDERS and rounded to subrounded COBBLES with a bluish grey sandy rounded to subrounded fine to coarse gravel infill. Sand is coarse. Fast water inflow at 1.70m depth.
2						END	42.99	2.20	TP terminated at 2.20m bgl. Unable to progress TP - ingress of water.
5									

Remarks: Ingress of water at 1.70m bgl. TP backfilled with arisings.

Scale: 1:25

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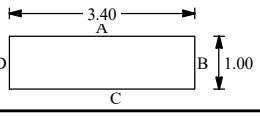
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T001
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,039.4 N 670,613.5
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 115.36m O.D.	**DATE:** 3.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.80m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 1.00 * 3.40m
LOGGED BY: MM



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							115.01	0.35	Grass over firm grey TOPSOIL with rootlets.
							114.46	0.90	Firm orangish grey slightly gravelly sandy SILT. Sand is medium. Gravel is rounded to subrounded fine to medium.
1									Stiff damp grey slightly gravelly sandy SILT. Gravel is angular to rounded of siltstone and shale.
		▼1							Fast water inflow from southeast corner of pit at 1.80m depth.
2			B 1	2.40-2.70					
							112.36	3.00	
3						END			TP terminated at 3.00m bgl. Unable to make progress - hard digging.
4									
5									

Remarks: Ingress of water at 1.80m bgl. TP backfilled with arisings.

Scale: 1:25

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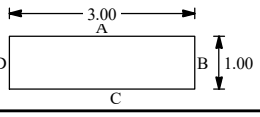
Fax

PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T002
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,245.5 N 670,310.0
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 142.32m O.D.	**DATE:** 3.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.00 * 3.00m
LOGGED BY: MM



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							142.02	0.30	Grass over firm brown gravelly SILT. Gravel is angular to subangular fine to medium.
							141.72	0.60	Brownish orange gravelly SILT.
			B 1	0.60-1.00			141.32	1.00	Brown silty clayey very sandy GRAVEL with traces of rootlets. Gravel is fine to medium.
1									1.00m: with low cobble content. Cobbles are flat and angular to subangular of shale siltstone and sandstone. Stiff grey gravelly sandy SILT. Sand is fine to medium. Gravel is rounded to subangular fine to coarse.
2			B 2	1.80-2.00			139.82	2.50	
						END			TP terminated at 2.50m bgl. Unable to make progress - hard digging.
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:25

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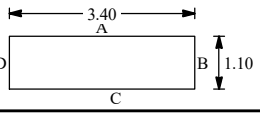
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T003
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,748.2 N 669,959.3
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 154.07m O.D.	**DATE:** 4.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 0.00m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.10 * 3.40m
LOGGED BY: MM



Shoring/Support: N/A
Stability:

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							153.67	0.40	TOPSOIL: Grass over firm brown slightly sandy gravelly SILT. Water seepage from GL to 1.00m depth observed (pit sides).
1									Firm grey mottled orange slightly sandy gravelly SILT interbedded with layers of blackish angular to subrounded gravel and cobbles. 1.00m to 1.60m: large boulder within southern face of TP.
			B 1	1.60-2.00			152.47	1.60	
2									Stiff bluish grey slightly sandy gravelly SILT/CLAY with low cobble content. Gravel is rounded to subangular fine to medium.
							151.57	2.50	
							END		TP terminated at 2.50m bgl. Obstruction as possible rock or boulder.
3									
4									
5									

Remarks: Ingress of water from g/l to 1.00m bgl. TP backfilled with arisings.

Scale: 1:25

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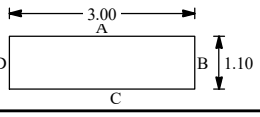
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T004
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,872.0 N 669,577.9
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 125.32m O.D.	**DATE:** 4.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.80m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.10 * 3.00m
LOGGED BY: MM



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							125.12	0.20	TOPSOIL: Grass over firm brown SILT.
							124.62	0.70	Firm brown gravelly SILT. Gravel is angular to subrounded.
1			B 1	0.70-1.00			123.62	1.70	Firm grey mottled orange slightly sandy gravelly SILT with low cobble content. Gravel is angular to subrounded of shale and sandstone. Cobbles are rounded to subangular of sandstone.
2		▼	B 2	1.70-2.30			123.02	2.30	Pinkish brown silty very sandy GRAVEL with low boulder content. Gravel is rounded to subangular fine to medium. Slight water seepage from pit side walls observed at 1.80m depth.
									END TP terminated at 2.30m bgl. Unable to make progress - hard digging.
3									
4									
5									

Remarks: Ingress of water at 1.80m bgl. TP backfilled with arisings.

Scale: 1:25

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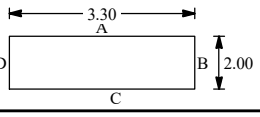
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T005
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,791.9 N 670,570.4
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: m O.D.	**DATE:** 7.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 3.30m
LOGGED BY: MM



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								0.20	TOPSOIL: Grass roots and briars over firm brown gravelly SILT with boulder. Boulders are rounded to subrounded of sandstone.
								0.40	Possible rock. Recovered as flat and angular sandstone clasts with orange sandy gravel infill.
			B 1	0.40		END			TP terminated at 0.40m bgl. Obstruction as probable rock.
1									
2									
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.
Unable to survey due to dense foliage - location set out using handhelkd GPS and with co-ordinates as received from client's representatives.

Scale: 1:25

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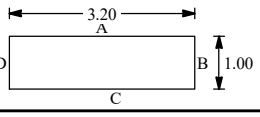
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T006
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 564,167.0 N 670,388.7
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: m O.D.	**DATE:** 7.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.00 * 3.20m
LOGGED BY: MM



Shoring/Support: N/A
Stability:

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0								0.38	TOPSOIL: Grass and briars over firm damp brown silty CLAY.
								1.20	Firm grey mottled orange slightly sandy gravelly SILT. Gravel is angular to subangular fine to medium of shale.
1			B 1	1.20-1.80					
								2.10	Stiff damp blue mottled grey slightly sandy gravelly silty CLAY. Gravel is fine to coarse of siltstone and shale.
2			B 2	2.10-2.70					
								2.70	Pinkish grey brown silty sandy GRAVEL with traces of rootlets. Gravel is fine to coarse, angular to subangular.
						END			TP terminated at 2.70m bgl. Obstruction as possible slate rock.
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.
Unable to record reduced level due to foliage.

Scale: 1:25

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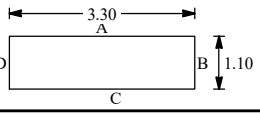
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T007
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 564,519.2 N 670,704.2
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: m O.D.	**DATE:** 7.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 320-140
PIT DIMENSION: 1.10 * 3.30m
LOGGED BY: MM



Shoring/Support: N/A
Stability:

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									Grass and tree roots over firm grey mottled orange slightly sandy sightly gravelly SILT.
								1.00	
1			B 1	1.00-1.50					Brown mottled grey silty clayey very sandy GRAVEL. Gravel is fine to coarse.
								1.50	
									Stiff bluish grey slightly sandy slightly gravelly CLAY. Gravel is flat and angular to subangular of shale.
2									1.90m: with high boulder content. Boulders are rounded to subrounded of sandstone and siltstone.
								2.30	
						END			TP terminated at 2.30m bgl. Obstruction as possible rock.
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.
Unable to record reduced level due to foliage.

Scale: 1:25

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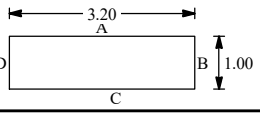
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T008
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 564,593.3 N 670,291.8
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 157.16m O.D.	**DATE:** 7.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 040-230
PIT DIMENSION: 1.00 * 3.20m
LOGGED BY: MM



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									
							156.96	0.20	TOPSOIL: Grass over firm brown gravelly SILT.
							156.66	0.50	TOPSOIL: Firm brownish orange sandy SILT.
1			B 1	0.50-1.00			155.66	1.50	Pinkish grey brown silty clayey very sandy GRAVEL with low cobble content and medium boulder content. Gravel is angular to subangular of shale and siltstone. Traces of rootlets.Gravel is fine to coarse.
							155.36	1.80	Blocky and angular to subrounded COBBLES and blocky and angular to subrounded BOULDERS with a silty gravelly infill.
2						END			TP terminated at 1.80m bgl. Obstruction as possible rock.
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:25

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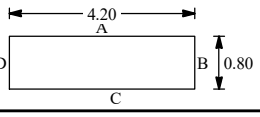
Appendix 01a
Trial Pit Records (Phase 2)

PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-A1
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,388.0 N 669,132.1
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: FINAL
Ground level: 51.07m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: 2.30m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 0.80 * 4.20m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							50.47	0.60	MADE GROUND: Small trees and grass over grey fine SAND.
1			B 1	1.00-1.30					MADE GROUND: Soft wet greyish brown sandy silty CLAY interbedded with layers of wet fine sand.
2		▼	B 2	2.00-2.30			48.77	2.30	
						END			TP terminated at 2.30m bgl. Unable to keep TP open - sidewall collapse and ingress of water.
3									
4									
5									

Remarks: Ground level may be incorrect due to extensive tree cover. Ingress of water at 2.30m bgl. TP backfilled with arisings.

Scale: 1:25

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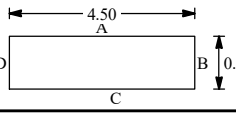
PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-A2
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,377.9 N 669,103.9
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: FINAL
Ground level: 50.49m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: 3.40m
2nd:
3rd:

PIT DIRECTION: 140-320
PIT DIMENSION: 0.80 * 4.50m
LOGGED BY: MM



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							49.69	0.80	MADE GROUND: Grass and shrubs over grey fine SAND.
1			B 1	1.00-1.30					MADE GROUND: Very soft damp grey organic clayey SILT and brown SAND with 5 to 10mm rootlets.
2			B 2	2.00-2.30			47.59	2.90	2.00m: becoming bluish grey. 2.40m: becoming wet.
3		▼1	B 3	3.00-3.30			47.09	3.40	MADE GROUND: Very soft wet grey clayey SILT interbedded with layers of wet orange fine sand.
4						END			TP terminated at 3.40m bgl. Unable to keep TP open - sidewall collapse and ingress of water.
5									

Remarks: Ingress of water at 3.40m bgl. TP backfilled with arisings.

Scale: 1:25

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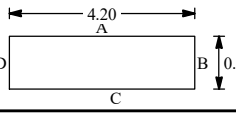
PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT: TP-A3**
LOCATION: Killaloe, Co. Clare	**Sheet 1 of 1**
CLIENT: RWE	**Co-ordinates:** E 562,413.7 N 669,079.4 — **Rig: 13T Hitachi**
ENGINEER: Fehily Timoney	**Rev: FINAL**
Ground level: 50.35m O.D.	**DATE: 13.5.22**

GROUNDWATER

Water strikes: Rose to after:
1st: 4.10m
2nd:
3rd:

PIT DIRECTION: 320-140
PIT DIMENSION: 0.80 * 4.20m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collape from 2.50m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							49.85	0.50	MADE GROUND: Grass and shrubs over firm brown CLAY with rootlets.
1			B 1	1.00-1.20					MADE GROUND: Very soft wet reddish brown SILT/CLAY with rootlets.
2			B 2	2.00-2.20			47.85	2.50	1.80m: becoming greyish brown.
3			B 3	3.00-3.20					MADE GROUND: Very soft greyish brown SILT/CLAY interbedded with layers of wet grey medium sand.
4			B 4	4.10-4.40			45.85	4.50	
5						END			TP terminated at 4.50m bgl.

Remarks: Ingress of water at 4.10m bgl. TP backfilled with arisings.

Scale: 1:25

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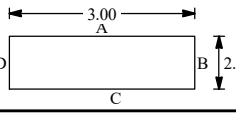
PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-A4
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,454.9 N 669,119.9
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: FINAL
Ground level: 50.90m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.40m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.80 * 3.00m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collape from 2.50m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									MADE GROUND: Grey fine SAND interbedded with layer of soft damp silt/clay.
1		1	B 1	1.00-1.30					1.40m: becoming wet.
2			B 2	2.00-2.30			48.40	2.50	
						END			TP terminated at 2.50m bgl. Unable to keep TP open - sidewall collapse.
3									
4									
5									

Remarks: TP wet from 1.40m bgl. TP backfilled with arisings.

Scale: 1:25

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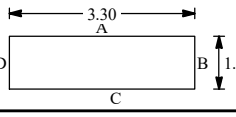
PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-A5
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,449.5 N 669,163.8
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: FINAL
Ground level: 51.86m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.90 * 3.30m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collape from 0.50m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0			B 1	0.00-1.50					MADE GROUND: Brown fine SAND interbedded with layer of soft brown silt/clay.
							50.36	1.50	
									MADE GROUND: Grey fine SAND.
2			B 2	2.00-2.30					
							48.86	3.00	
3			B 3	3.00-3.40					MADE GROUND: Damp grey fine SAND interbedded with layer of soft damp reddish brown clay.
							48.46	3.40	
						END			TP terminated at 3.40m bgl. Unable to keep TP open - sidewall collapse.
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:25

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Appendix 02
Laboratory Test Results

Project ID	2021CE103R	Client	RWE	Remarks	Turnarou
Project Name	**Fahey Beg Wind Farm**	Report date	19/02/2022		
Schedule ID	2021CE103R_1	Scheduled Date	16/02/2022		

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	Water soluble sulphate content of soil sample (2:1 water / soil extract)	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							
TP-C1	1.00		B	1	03/02/22		1				1	1																																		
TP-S2	1.70	2.20	B	1	03/02/22																																									
TP-T001	2.40	2.70	B	1	03/02/22																																								
TP-T002	0.60	1.00	B	1	03/02/22		1				1				1				1																										
TP-T002	1.80	2.00	B	2	03/02/22																																								
TP-T003	1.60	2.00	B	1	04/02/22						1																																		
TP-T004	0.70	1.00	B	1	04/02/22																																								
TP-T004	1.70	2.30	B	2	04/02/22						1	1																																		
TP-T005	0.40		B	1	07/02/22																																									
TP-T006	1.20	1.80	B	1	07/02/22		1				1	1			1				1																										
TP-T006	2.10	2.70	B	2	07/02/22						1																																		
TP-T007	1.00	1.50	B	1	07/02/22						1				1				1																										
TP-T008	0.50	1.00	B	1	04/02/22						1																																		
	Completed in K4 Soils						3				8	3			3				3																										

0 = test scheduled,
1 = test completed,
0* = sample not suitable for scheduled test

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
31592	Fahey Beg Wind Farm	Samples received	21/03/2022
		Schedule received	10/03/2022
Project No.	Client	Project started	22/03/2022
2021CE103R	Irish Drilling	Testing Started	

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
TP-C1	1	1.00	-	B	Brown mottled grey slightly organic slightly fine sandy clayey SILT	34	-	-	-	-	NMC Only
TP-T002	1	0.60	1.00	B	Brown silty clayey very sandy GRAVEL with traces of fine rootlets (gravel is fmc slate fragments)	14	-	-	-	-	NMC Only
TP-T006	1	1.20	1.80	B	Brown slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-angular)	13	-	-	-	-	NMC Only

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3 and 5.0
These results only apply to the items tested

NOTE: The report shall not be reproduced except in full without authority of the laboratory

Test Report by K4 SOILS LABORATORY
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Checked and Approved

Initials J.P

Date: 13/04/2022

2519

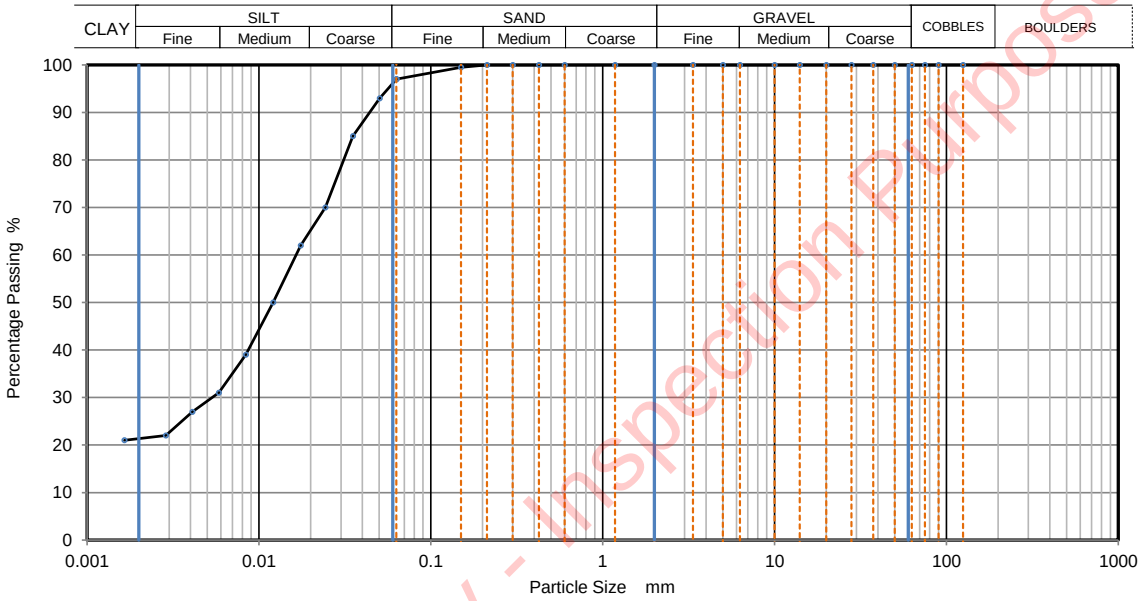
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R1(b)

PARTICLE SIZE DISTRIBUTION

				Job Ref	31592
				Borehole/Pit No.	TP-C1
Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.00 m
Soil Description	Brown mottled grey slightly organic slightly fine sandy clayey SILT			Depth Base	- m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	97
90	100	0.0505	93
75	100	0.0352	85
63	100	0.0243	70
50	100	0.0175	62
37.5	100	0.0121	50
28	100	0.0084	39
20	100	0.0058	31
14	100	0.0041	27
10	100	0.0029	22
6.3	100	0.0016	21
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.70	Mg/m3
0.3	100		
0.212	100		
0.15	100		
0.063	97		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.0
Sand	3.0
Silt	75.9
Clay	21.1

Grading Analysis		
D100	mm	
D60	mm	0.0165
D30	mm	0.00525
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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MSF-5-R3

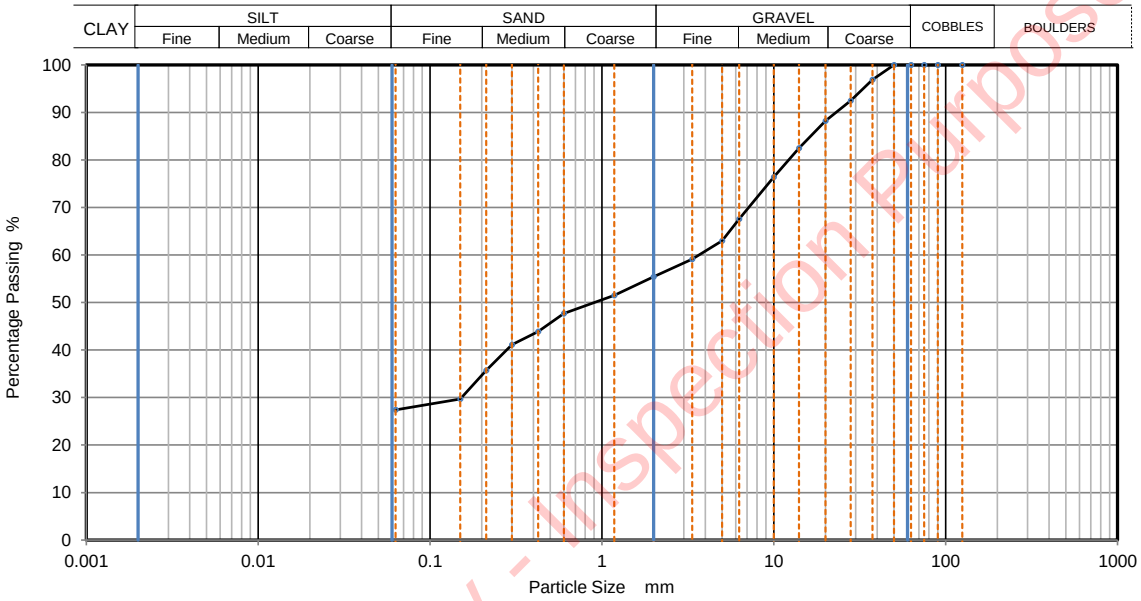
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	0.60 m
Soil Description	Brown silty clayey very sandy GRAVEL with traces of fine rootlets (gravel is fmc slate fragments)			Depth Base	1.00 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T002

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	97		
28	93		
20	88		
14	83		
10	76		
6.3	68		
5	63		
3.35	59		
2	55		
1.18	52		
0.6	48		
0.425	44		
0.3	41		
0.212	36		
0.15	30		
0.063	27		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	44.6
Sand	28.0
Fines <0.063mm	27.4

Grading Analysis		
D100	mm	
D60	mm	3.69
D30	mm	0.153
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Date: 13/04/2022

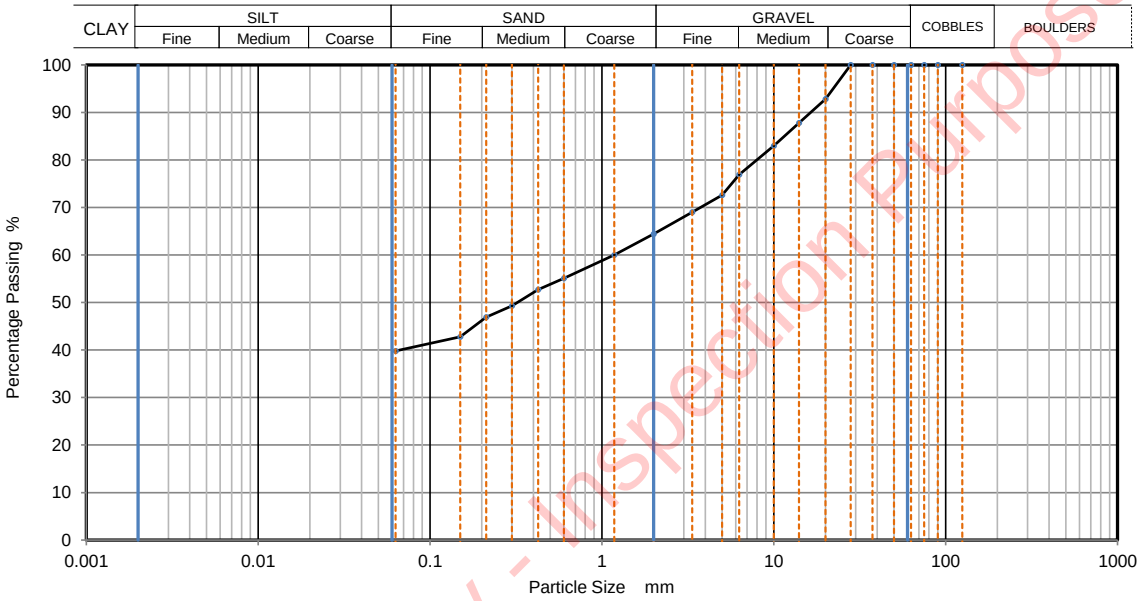
MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.60 m
Soil Description	Brown slightly mottled grey slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-rounded)			Depth Base	2.00 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592
Borehole/Pit No.: TP-T003

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	93		
14	88		
10	83		
6.3	77		
5	73		
3.35	69		
2	64		
1.18	60		
0.6	55		
0.425	53		
0.3	49		
0.212	47		
0.15	43		
0.063	40		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	35.6
Sand	24.6
Fines <0.063mm	39.8

Grading Analysis		
D100	mm	
D60	mm	1.18
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Date: 13/04/2022

MSF-5-R3

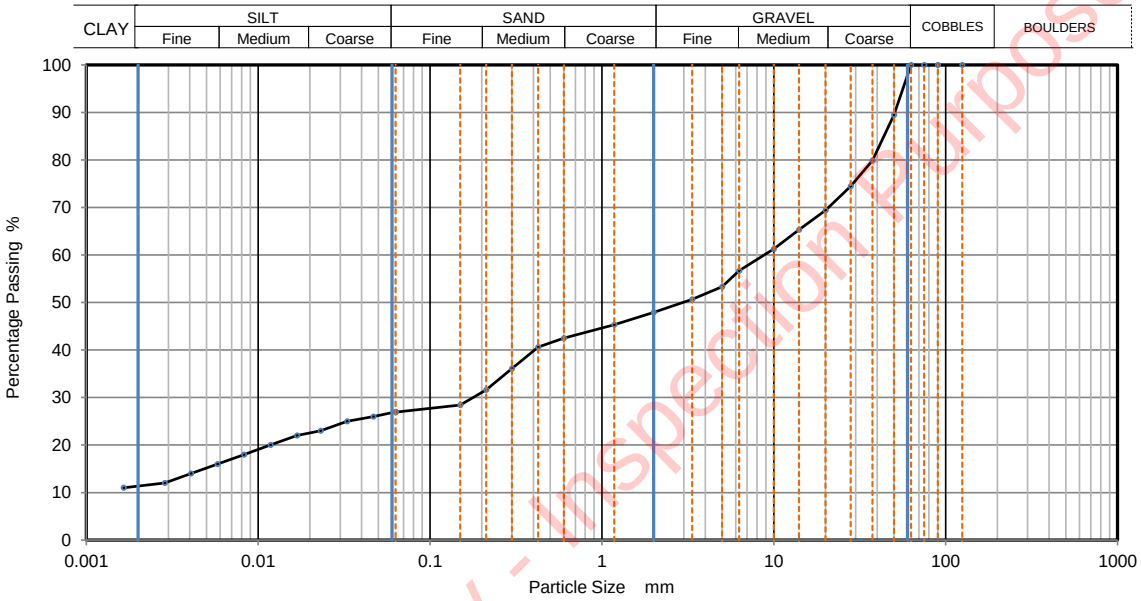
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	2
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.70 m
Soil Description	Brown clayey silty very sandy GRAVEL (gravel is fmc and angular to sub-angular)			Depth Base	2.30 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T004

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	27
90	100	0.0467	26
75	100	0.0329	25
63	100	0.0231	23
50	90	0.0168	22
37.5	80	0.0118	20
28	75	0.0083	18
20	69	0.0058	16
14	65	0.0041	14
10	61	0.0029	12
6.3	57	0.0016	11
5	53		
3.35	51		
2	48		
1.18	45		
0.6	43	Particle density (assumed)	
0.425	41	2.70 Mg/m3	
0.3	36		
0.212	32		
0.15	28		
0.063	27		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	52.1
Sand	21.0
Silt	15.4
Clay	11.5

Grading Analysis		
D100	mm	
D60	mm	8.76
D30	mm	0.178
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Date: 13/04/2022

MSF-5-R3

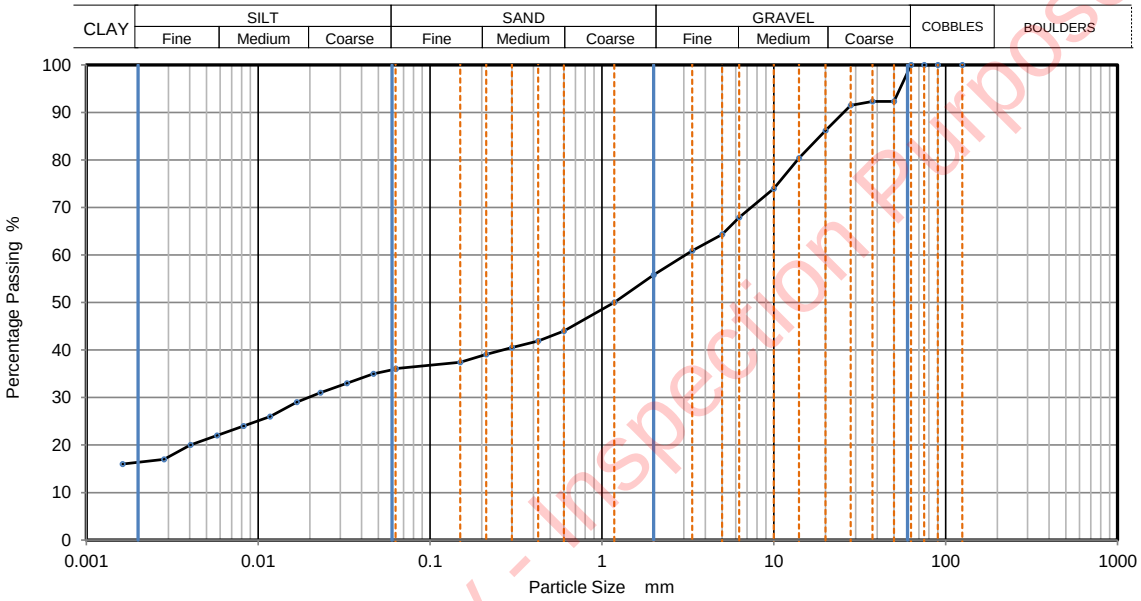
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.20 m
Soil Description	Brown slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-angular)			Depth Base	1.80 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T006

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	36
90	100	0.0468	35
75	100	0.0328	33
63	100	0.0230	31
50	92	0.0168	29
37.5	92	0.0117	26
28	92	0.0082	24
20	86	0.0058	22
14	80	0.0040	20
10	74	0.0028	17
6.3	68	0.0016	16
5	64		
3.35	61		
2	56		
1.18	50		
0.6	44	Particle density (assumed)	
0.425	42	2.70 Mg/m3	
0.3	41		
0.212	39		
0.15	37		
0.063	36		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	44.2
Sand	19.7
Silt	20.1
Clay	16.0

Grading Analysis		
D100	mm	
D60	mm	3.05
D30	mm	0.0194
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Initials: J.P

Date: 13/04/2022

MSF-5-R3

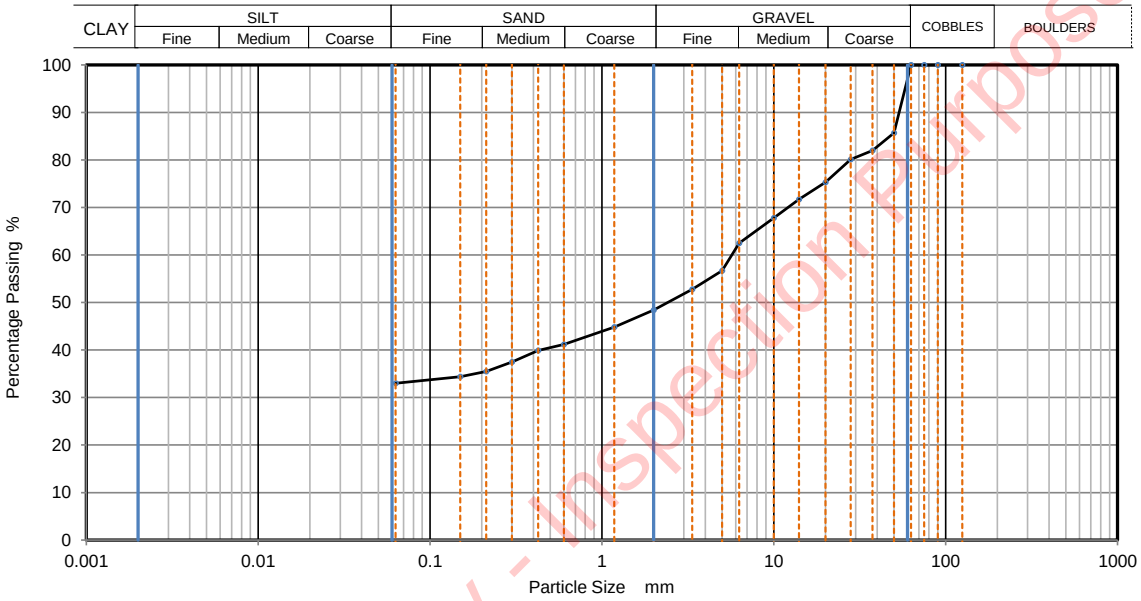
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	2
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	2.10 m
Soil Description	Brown silty clayey sandy GRAVEL with occasional fine rootlets (gravel is fmc and angular to sub-angular)			Depth Base	2.70 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T006

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	86		
37.5	82		
28	80		
20	75		
14	72		
10	68		
6.3	63		
5	57		
3.35	53		
2	48		
1.18	45		
0.6	41		
0.425	40		
0.3	38		
0.212	36		
0.15	34		
0.063	33		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	51.6
Sand	15.4
Fines <0.063mm	33.0

Grading Analysis		
D100	mm	
D60	mm	5.71
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Initials: J.P

Date: 13/04/2022

MSF-5-R3

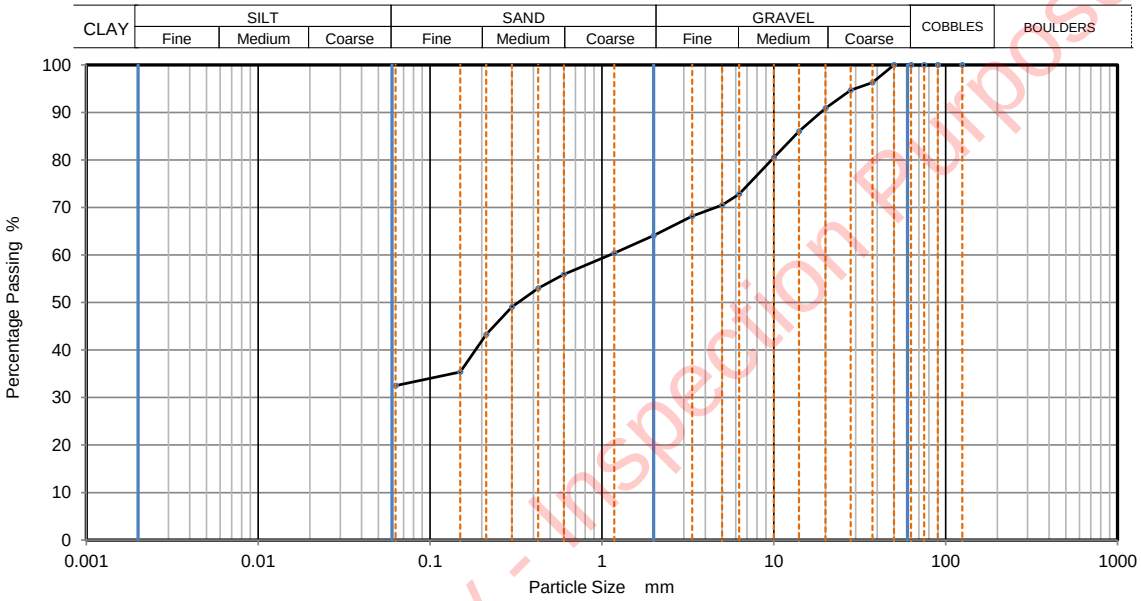
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.00 m
Soil Description	Brown mottled grey silty clayey very sandy GRAVEL (gravel is fmc slate fragments)			Depth Base	1.50 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T007

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	96		
28	95		
20	91		
14	86		
10	81		
6.3	73		
5	71		
3.35	68		
2	64		
1.18	60		
0.6	56		
0.425	53		
0.3	49		
0.212	43		
0.15	35		
0.063	33		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	35.9
Sand	31.6
Fines <0.063mm	32.5

Grading Analysis		
D100	mm	
D60	mm	1.12
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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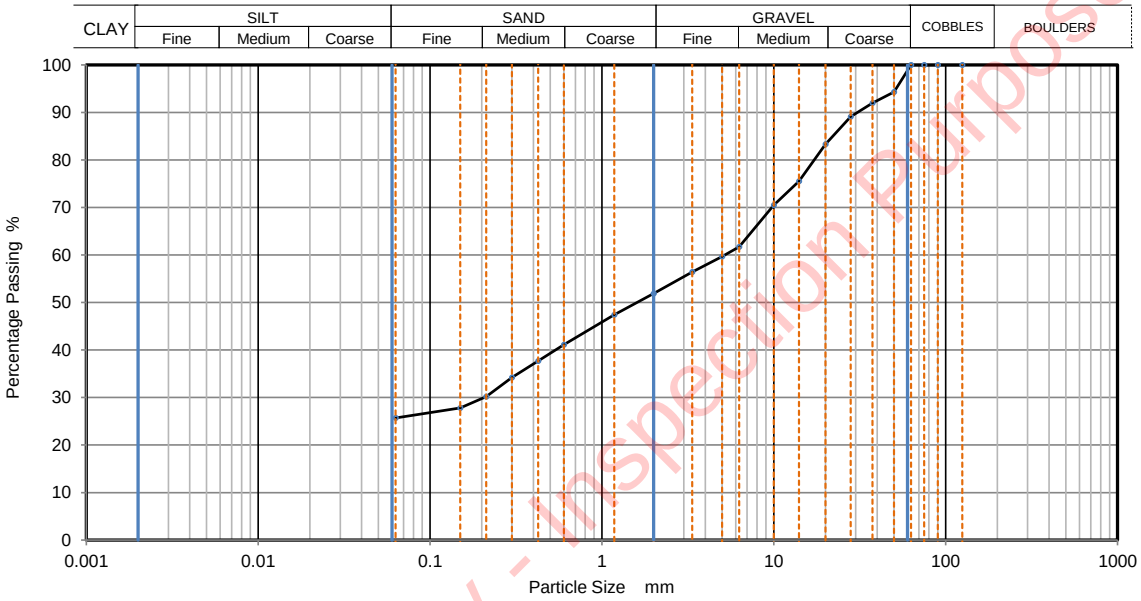
Initials: J.P

Date: 13/04/2022

PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Job Ref	31592
				Borehole/Pit No.	TP-T008
Project No.	2021CE103R	Client	Irish Drilling	Sample No.	1
				Depth Top	0.50 m
Soil Description	Brown silty clayey very sandy GRAVEL with occasional fine rootlets (gravel is fmc slate fragments)			Depth Base	1.00 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
These results only apply to the items tested				Date tested	12/04/2022



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	94		
37.5	92		
28	89		
20	83		
14	76		
10	71		
6.3	62		
5	60		
3.35	56		
2	52		
1.18	47		
0.6	41		
0.425	38		
0.3	34		
0.212	30		
0.15	28		
0.063	26		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	48.1
Sand	26.2
Fines <0.063mm	25.8

Grading Analysis		
D100	mm	
D60	mm	5.18
D30	mm	0.207
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Initials: J.P

Date: 13/04/2022

MSF-5-R3

Sulphate Content (Gravimetric Method) for 2:1 Soil: Water Extract and pH Value - Summary of Results
Tested in accordance with BS1377 : Part 3 : 2018, Clause 7.6 & Clause 12

Job No.	Project Name	Programme	
31592	Fahey Beg Wind Farm	Samples received	21/03/2022
		Schedule received	10/03/2022
Project No.	Client	Project started	22/03/2022
2021CE103R	Irish Drilling	Testing Started	11/04/2022

Hole No.	Sample Ref	Top m	Base m	Type	Soil description	Dry Mass passing 2mm %	SO4 Content mg/l	pH	Remarks
TP-T002	1	0.60	1.00	B	Brown silty clayey very sandy GRAVEL with traces of fine rootlets (gravel is fmc slate fragments)	55	320	7.85	
TP-T006	1	1.20	1.80	B	Brown slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-angular)	56	210	7.82	
TP-T007	1	1.00	1.50	B	Brown mottled grey silty clayey very sandy GRAVEL (gravel is fmc slate fragments)	64	270	7.83	

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Checked and Approved

Initials J.P

Date: 13/04/2022

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MSF-5-R29

Appendix 02a
Laboratory Test Results (Phase 2)

Project ID	2021CE102		Client	RWE	Remarks
Project Name	Fahey Beg Wind Farm		Due Date	24/05/2022 11:12	
Schedule ID	2021CE102_2		Scheduled Date	24/05/2022 11:12	

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	Water soluble sulphate content of soil sample (2:1 water / soil extract)	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	
TP-001	1.00	1.30	B	1	13/05/22		1				1	1			1			1																					ALS 220706-92
TP-001	2.00	2.30	B	2	13/05/22																																		
TP-002	1.00	1.30	B	1	13/05/22																																		
TP-002	2.00	2.30	B	2	13/05/22		1	1					1					1																					ALS 220706-92
TP-002	3.00	3.30	B	3	13/05/22																																		
TP-003	1.00	1.20	B	1	13/05/22																																		
TP-003	2.00	2.20	B	2	13/05/22		1	1																															
TP-003	3.00	3.20	B	3	13/05/22																																		
TP-003	4.10	4.40	B	4	13/05/22		1	1			1	1			1			1																					ALS 220706-92
TP-004	1.00	1.30	B	1	13/05/22		1				1	1			1			1																					ALS 220706-92
TP-004	2.00	2.30	B	2	13/05/22																																		
TP-005	0.00	1.50	B	1	13/05/22						1																													
TP-005	2.00	2.30	B	2	13/05/22																																		
TP-005	3.00	3.40	B	3	13/05/22																																		

0 = test scheduled,
1 = test completed as scheduled,
0 = sample not suitable for scheduled test

Summary of Classification Test Results

Project No.: 2021CE102

Project Name: Fahey Beg 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-001	1	1.00	1.30	B		Brown sandy SILT. Sand is fine.			25.0	100					
TP-002	2	2.00	2.30	B		Brown SAND.			37.0	100					NP
TP-003	2	2.00	2.20	B		Brown SILT			44.0	100	44	26	18		MI
TP-003	4	4.10	4.40	B		Brown slightly sandy SILT. Sand is fine.			30.0	100	31	22	9		CL
TP-004	1	1.00	1.30	B		Brown very silty fine and medium SAND.			17.0	98					
TP-005	1	0.00	1.50	B		Brown slightly sandy SILT.			47.0	99					

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: 07/12/2022 00:00

QC From No: R1

Approved By:

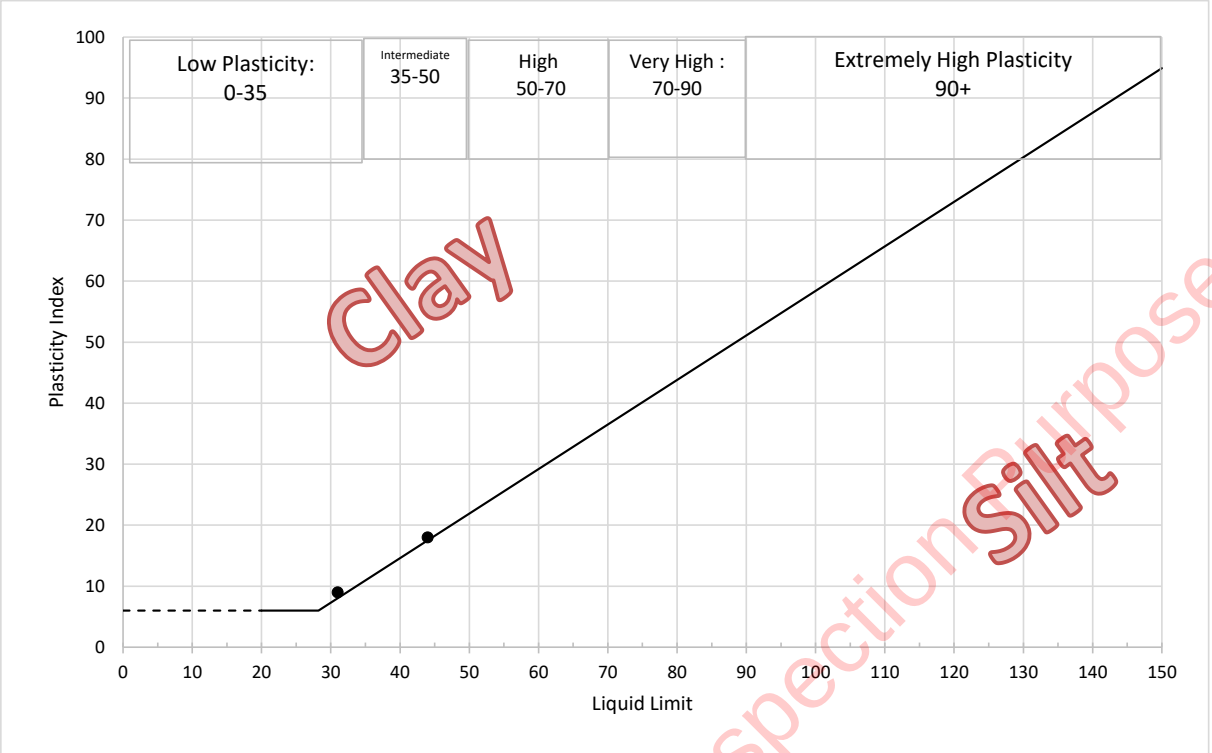
Table 1

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:	**Fahey Beg Wind Farm**	
Location:		2021CE102



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

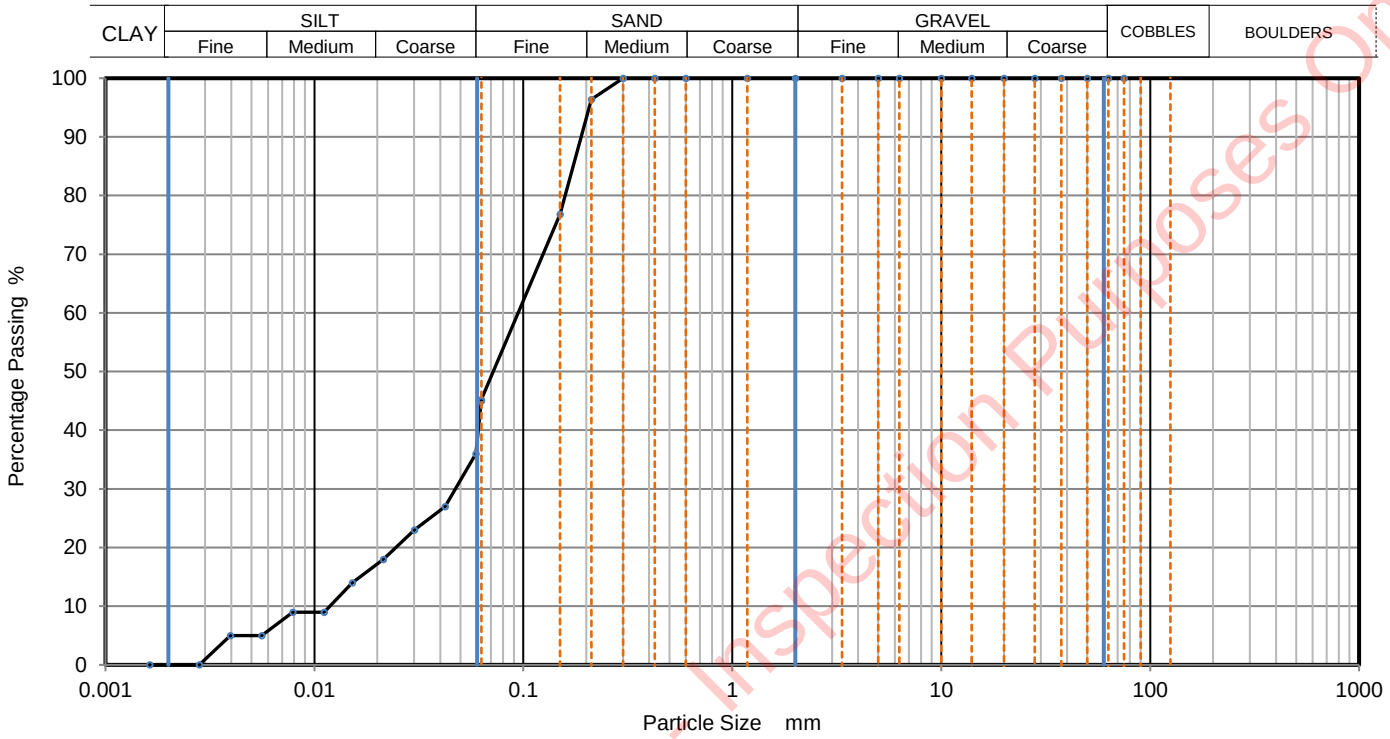
Plasticity abeviations: L = Low, I = Intermediate = H = High, V = Very High, E = Extremely High.

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	**2021CE102**
				Borehole/Pit No.	TP-001
Site Name	Fahey Beg Wind Farm			Sample No.	1
Soil Description	Brown sandy SILT. Sand is fine.			Depth, m	1.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL12022052432



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	45
		0.0592	36
75	100	0.0423	27
63	100	0.0301	23
50	100	0.0214	18
37.5	100	0.0152	14
28	100	0.0111	9
20	100	0.0079	9
14	100	0.0056	5
10	100	0.0040	5
6.3	100	0.0028	0
5	100	0.0016	0
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.65	Mg/m3
0.3	100		
0.212	96		
0.15	77		
0.063	45		

Dry Mass of sample, g	266

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	55
Silt	45
Clay	0

Grading Analysis		
D100	mm	
D60	mm	0.0947
D30	mm	0.0471
D10	mm	0.0119
Uniformity Coefficient		8
Curvature Coefficient		2

Remarks

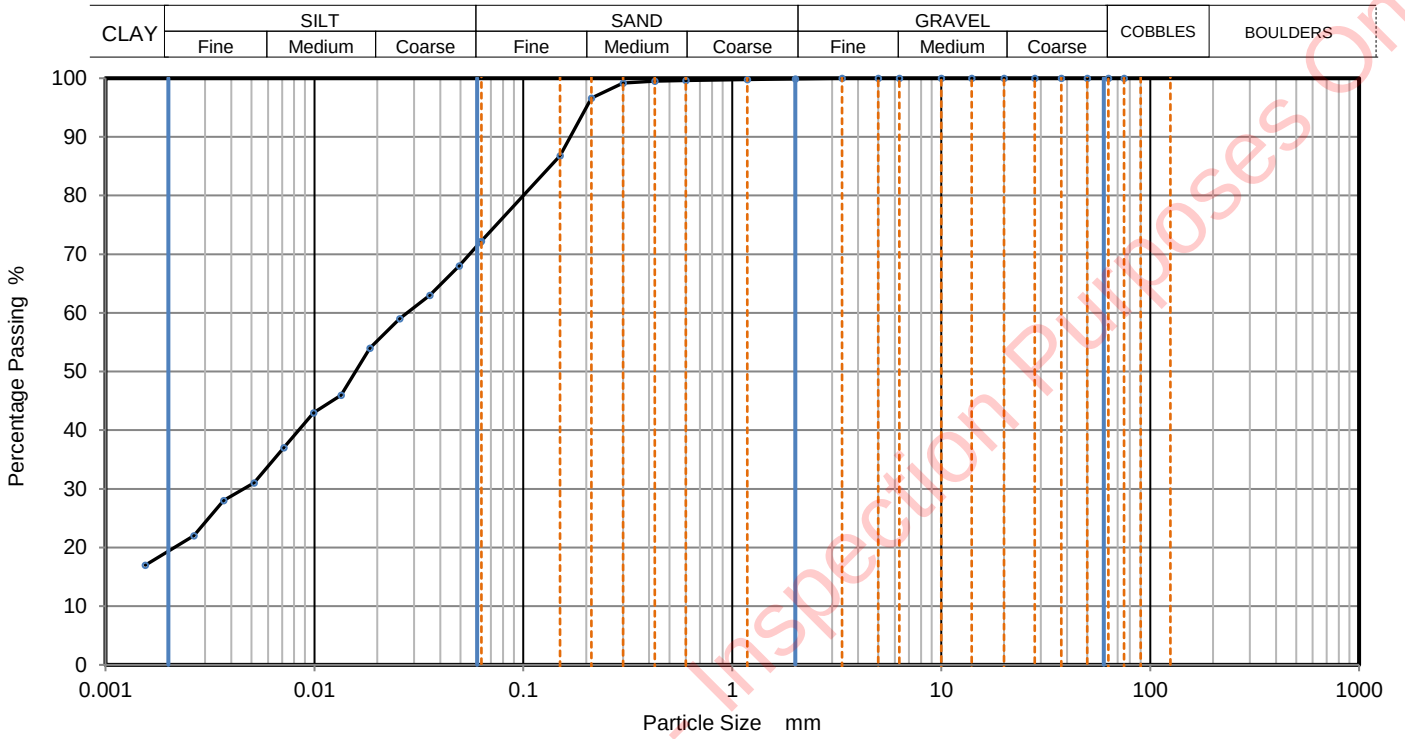
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	12/07/2022 11:22	**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	**2021CE102**
		Borehole/Pit No.	TP-003
Site Name	Fahey Beg Wind Farm	Sample No.	4
Soil Description	Brown slightly sandy SILT. Sand is fine.	Depth, m	4.10
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	KeyLAB ID	IDL12022052440



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0621	72
		0.0493	68
75	100	0.0356	63
63	100	0.0256	59
50	100	0.0185	54
37.5	100	0.0134	46
28	100	0.0099	43
20	100	0.0071	37
14	100	0.0051	31
10	100	0.0037	28
6.3	100	0.0026	22
5	100	0.0016	17
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	100	2.65 Mg/m3	
0.3	99		
0.212	97		
0.15	87		
0.063	72		

Dry Mass of sample, g	325

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	28
Silt	53
Clay	19

Grading Analysis		
D100	mm	
D60	mm	0.0274
D30	mm	0.0045
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

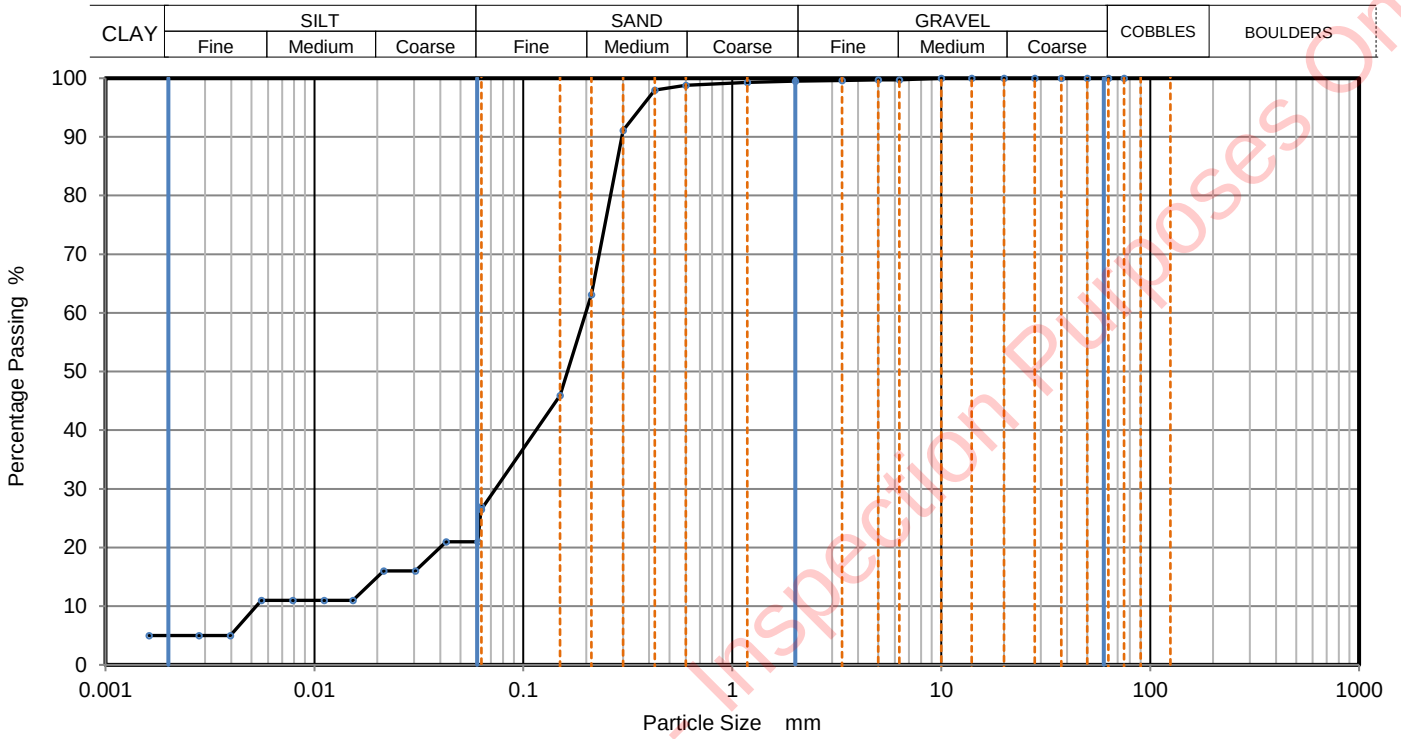
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	12/07/2022 11:22	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	**2021CE102**
		Borehole/Pit No.	TP-004
Site Name	Fahey Beg Wind Farm	Sample No.	1
Soil Description	Brown very silty fine and medium SAND.	Depth, m	1.00
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	KeyLAB ID	IDL12022052441



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	27
		0.0604	21
75	100	0.0427	21
63	100	0.0304	16
50	100	0.0215	16
37.5	100	0.0153	11
28	100	0.0111	11
20	100	0.0079	11
14	100	0.0056	11
10	100	0.0040	5
6.3	100	0.0028	5
5	100	0.0016	5
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density (assumed)	
0.425	98	2.65 Mg/m3	
0.3	91		
0.212	63		
0.15	46		
0.063	27		

Dry Mass of sample, g	363

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	73
Silt	21
Clay	5

Grading Analysis		
D100	mm	
D60	mm	0.199
D30	mm	0.0736
D10	mm	0.00536
Uniformity Coefficient		37
Curvature Coefficient		5.1

Remarks

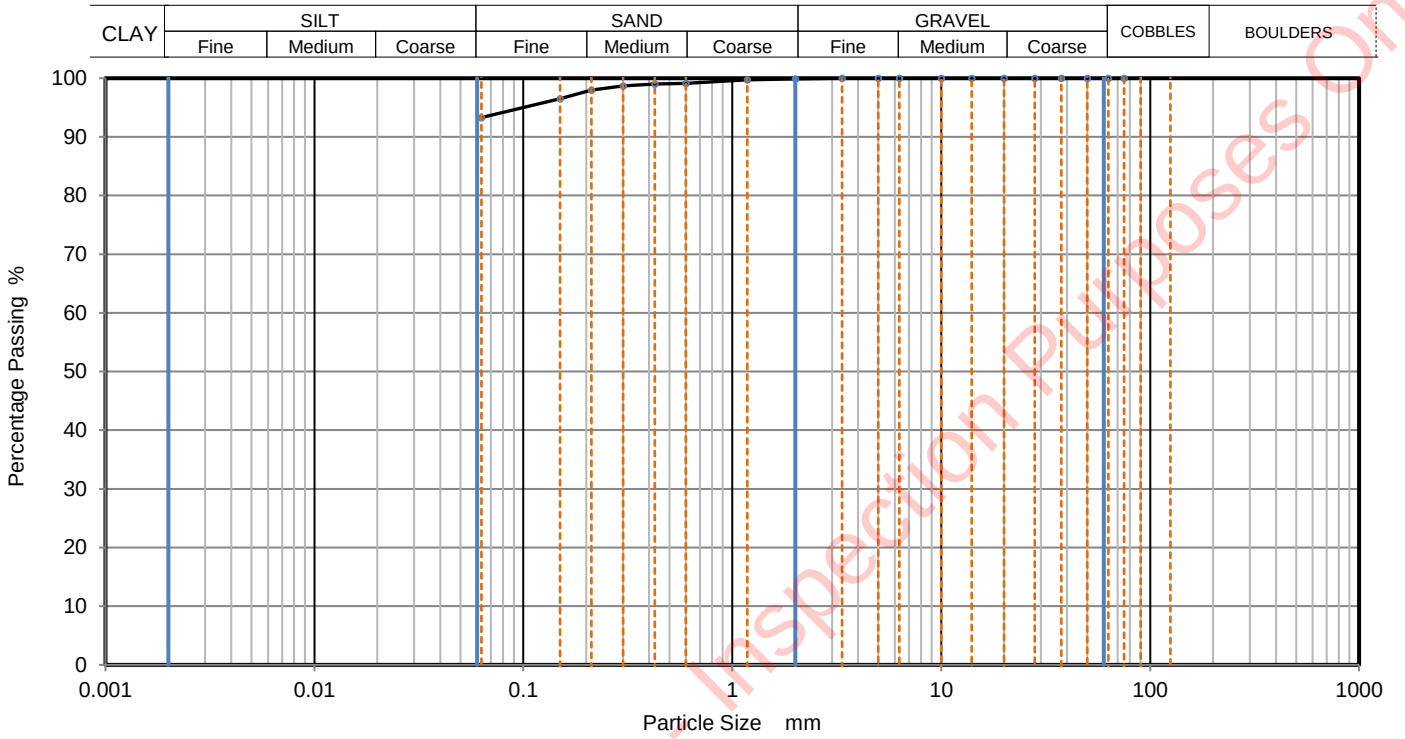
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	12/07/2022 11:22	**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	**2021CE102**
				Borehole/Pit No.	TP-005
Site Name	Fahey Beg Wind Farm			Sample No.	1
Soil Description	Brown slightly sandy SILT.			Depth, m	0.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12022052443



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	100		
1.18	100		
0.6	99		
0.425	99		
0.3	99		
0.212	98		
0.15	97		
0.063	93		

Dry Mass of sample, g	387

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	7
Fines <0.063mm	93

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.	12/07/2022 11:22	**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.

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528777
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:	13 July 2022
Customer:	Irish Drilling Limited
Sample Delivery Group (SDG):	220706-92
Your Reference:	2021CE102
Location:	Faheybeg WF
Report No:	654229
Order Number:	11407

We received 4 samples on Wednesday July 06, 2022 and 4 of these samples were scheduled for analysis which was completed on Wednesday July 13, 2022. 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.

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

1291

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
26546501	TP001	B1	1.00 - 1.30	13/05/2022
26546507	TP002	B2	2.00 - 2.30	13/05/2022
26546511	TP003	B4	4.10 - 4.40	13/05/2022
26546514	TP004	B1	1.00 - 1.30	13/05/2022

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

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
			26546501	TP001	B1	1.00 - 1.30	250g Amber Jar (ALE210)	S
			26546507	TP002	B2	2.00 - 2.30	250g Amber Jar (ALE210)	S
			26546511	TP003	B4	4.10 - 4.40	250g Amber Jar (ALE210)	S
			26546514	TP004	B1	1.00 - 1.30	250g Amber Jar (ALE210)	S
Anions by Kone (soil)	All	NDPs: 0 Tests: 4	X	X	X	X		
pH	All	NDPs: 0 Tests: 4	X	X	X	X		
Sample description	All	NDPs: 0 Tests: 4	X	X	X	X		
Total Organic Carbon	All	NDPs: 0 Tests: 1		X				

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
26546501	TP001	1.00 - 1.30	Light Brown	Loamy Sand	Vegetation	None
26546507	TP002	2.00 - 2.30	Light Brown	Silty Clay	None	None
26546511	TP003	4.10 - 4.40	Light Brown	Silt Loam	None	None
26546514	TP004	1.00 - 1.30	Light Brown	Sand	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.

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

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.	TP001	TP002	TP003	TP004		
			Depth (m)	1.00 - 1.30	2.00 - 2.30	4.10 - 4.40	1.00 - 1.30		
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)		
			Date Sampled	13/05/2022	13/05/2022	13/05/2022	13/05/2022		
			Sample Time	-	-	-	-		
			Date Received	06/07/2022	06/07/2022	06/07/2022	06/07/2022		
			SDG Ref	220706-92	220706-92	220706-92	220706-92		
			Lab Sample No.(s)	26546501	26546507	26546511	26546514		
			AGS Reference	B1	B2	B4	B1		
Moisture Content Ratio (% of as received sample)	%	PM024		19	22	23	15		
Soil Organic Matter (SOM)	<0.35 %	TM132			0.795 @ #				
pH	1 pH Units	TM133		8.65 @ M	7.76 @ M	8.41 @ M	8.3 @ M		
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.01 @ M	0.0279 @ M	0.0141 @ M	0.0069 @ 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
TM243		Mixed Anions In Soils By Kone

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM).

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

Test Completion Dates

Lab Sample No(s)	26546501	26546507	26546511	26546514
Customer Sample Ref.	TP001	TP002	TP003	TP004
AGS Ref.	B1	B2	B4	B1
Depth	1.00 - 1.30	2.00 - 2.30	4.10 - 4.40	1.00 - 1.30
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	13-Jul-2022	12-Jul-2022	13-Jul-2022	13-Jul-2022
pH	11-Jul-2022	11-Jul-2022	08-Jul-2022	11-Jul-2022
Sample description	07-Jul-2022	07-Jul-2022	07-Jul-2022	07-Jul-2022
Total Organic Carbon		13-Jul-2022		

SDG:	220706-92	**Report Number:**	654229	**Superseded Report:**	
Client Ref:	2021CE102	**Location:**	Faheybeg WF		

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. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

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 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **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.

19. **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**

20. **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 (2021), 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 and soils are obtained from supplied bulk materials andd soils 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 (2021).

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.

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.

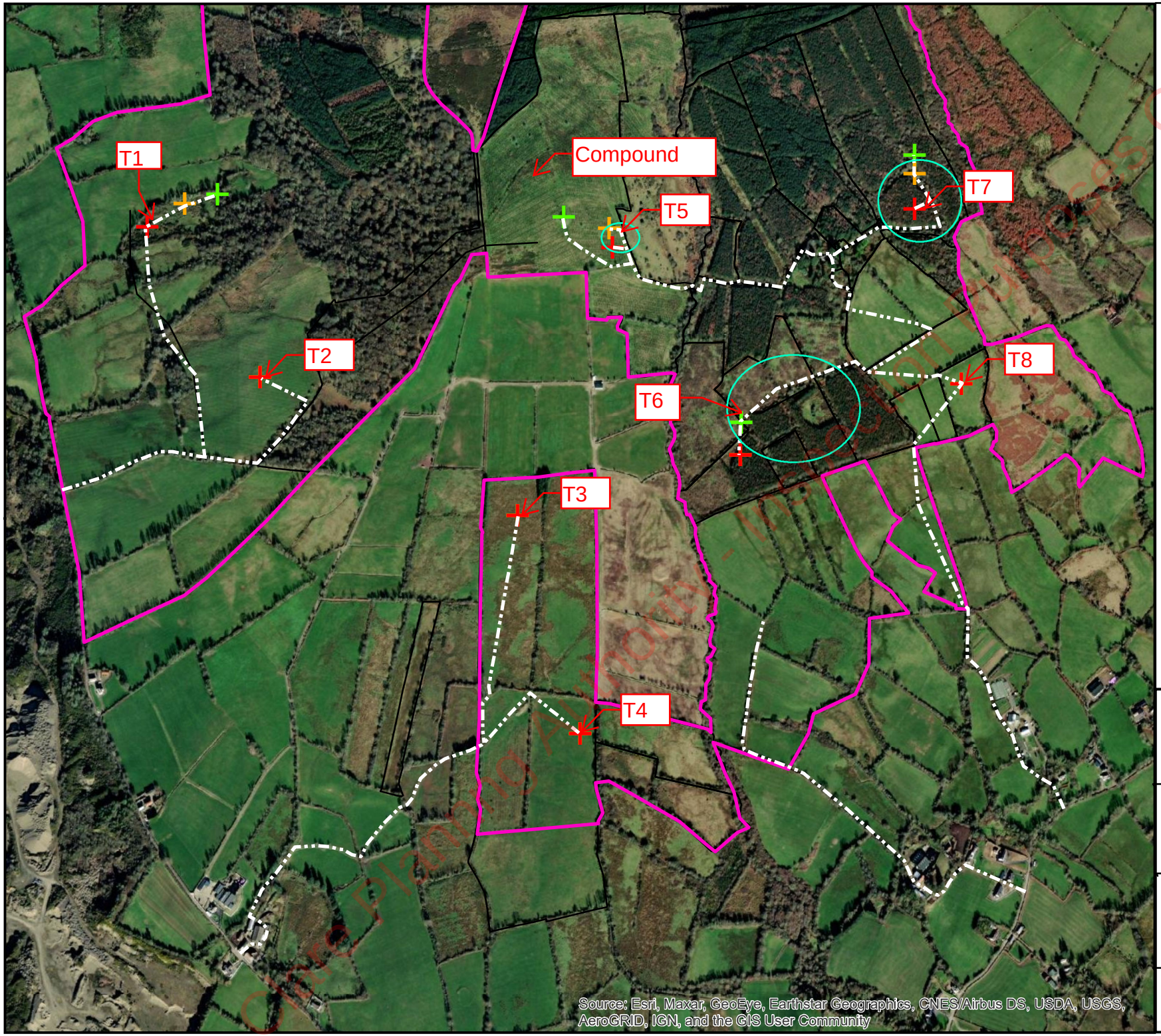
Respirable Fibres

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.

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 03
Site Plan



Project Area

Digger Access

Felliong required

N
W E
S

0 250 500 m

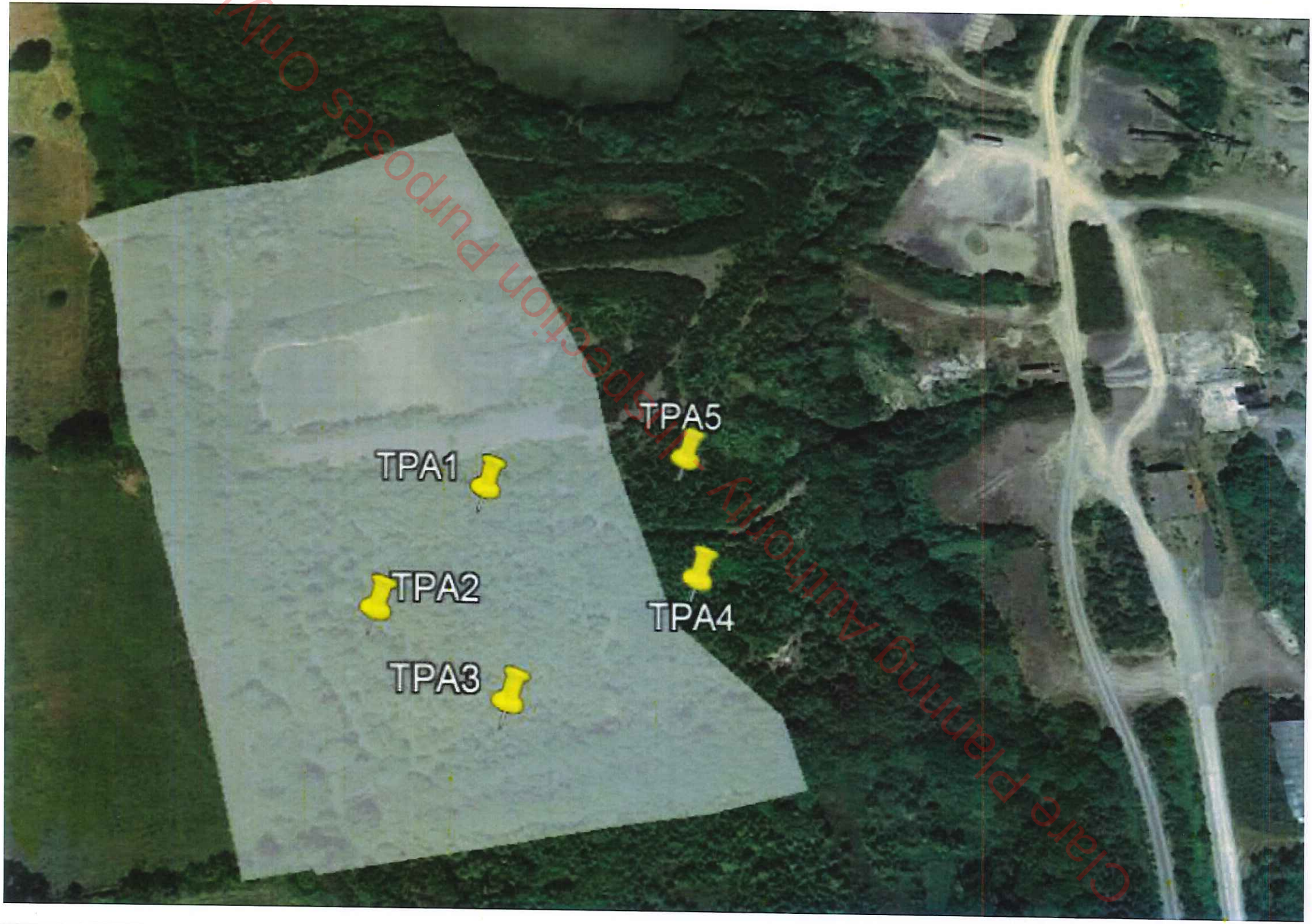
Map Title:

Fahybeg
SI Access 7Ton

Map Scales:

1:10,000 @ DIN A3

RWE



Appendix 04
Trial Pit Photographs (Phase 2)

Figure 1 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-1 (1).JPG

Figure 2 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-1 (2).JPG

Figure 3 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-2 (1).JPG

Figure 4 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-2 (2).JPG

Figure 5 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-3 (1).JPG

Figure 6 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-3 (2).JPG

Figure 7 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-4 (1).JPG

Figure 10 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-5 (2).JPG

Figure 8 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-4 (2).JPG

Figure 9 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-5 (1).JPG

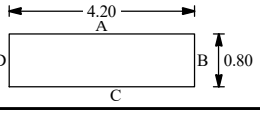
Appendix 05
AGS Data

PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-001
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,388.0 N 669,132.1
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: DRAFT
Ground level: 51.07m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: 2.30m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 0.80 * 4.20m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							50.47	0.60	MADE GROUND: Small trees and grass over grey fine SAND.
1			B 1	1.00-1.30					MADE GROUND: Soft wet greyish brown sandy silty CLAY interbedded with layers of wet fine sand.
2			B 2	2.00-2.30			48.77	2.30	
						END			TP terminated at 2.30m bgl. Unable to keep TP open - sidewall collapse and ingress of water.
3									
4									
5									

Remarks: Ground level may be incorrect due to extensive tree cover. Ingress of water at 2.30m bgl. TP backfilled with arisings.

Scale: 1:25

irish drilling

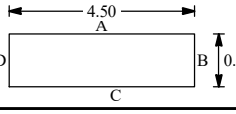
Ph.
Fax

PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-002
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,377.9 N 669,103.9
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: DRAFT
Ground level: 50.49m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: 3.40m
2nd:
3rd:

PIT DIRECTION: 140-320
PIT DIMENSION: 0.80 * 4.50m
LOGGED BY: MM



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							49.69	0.80	MADE GROUND: Grass and shrubs over grey fine SAND.
1			B 1	1.00-1.30					MADE GROUND: Very soft damp grey organic clayey SILT with 5 to 10mm rootlets.
2			B 2	2.00-2.30					2.00m: becoming bluish grey.
							47.59	2.90	2.40m: becoming wet.
3			B 3	3.00-3.30			47.09	3.40	MADE GROUND: Very soft wet grey clayey SILT interbedded with layers of wet orange fine sand.
						END			TP terminated at 3.40m bgl. Unable to keep TP open - sidewall collapse and ingress of water.
4									
5									

Remarks: Ingress of water at 3.40m bgl. TP backfilled with arisings.

Scale: 1:25

irish drilling

Ph.
Fax

PROJECT: Fahybeg Wind Farm - Additional Works
LOCATION: Killaloe, Co. Clare

TRIALPIT: TP-003
Sheet 1 of 1

CLIENT: RWE
ENGINEER: Fehily Timoney

Co-ordinates: E 562,413.7 N 669,079.4

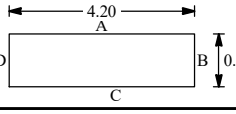
Rig: 13T Hitachi
Rev: DRAFT

Ground level: 50.35m O.D.

DATE: 13.5.22

GROUNDWATER
Water strikes: Rose to after:
1st: 4.10m
2nd:
3rd:

PIT DIRECTION: 320-140
PIT DIMENSION: 0.80 * 4.20m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collape from 2.50m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							49.85	0.50	MADE GROUND: Grass and shrubs over firm brown CLAY with rootlets.
1			B 1	1.00-1.20					MADE GROUND: Very soft wet reddish brown CLAY with rootlets.
2			B 2	2.00-2.20			47.85	2.50	1.80m: becoming greyish brown.
3			B 3	3.00-3.20					MADE GROUND: Very soft greyish brown CLAY interbedded with layers of wet grey medium sand.
4		▼	B 4	4.10-4.40			45.85	4.50	
5						END			TP terminated at 4.50m bgl.

Remarks: Ingress of water at 4.10m bgl. TP backfilled with arisings.

Scale: 1:25

irish drilling

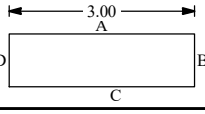
Ph.
Fax

PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-004
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,454.9 N 669,119.9
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: DRAFT
Ground level: 50.90m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.40m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.80 * 3.00m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collape from 2.50m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									MADE GROUND: Grey fine SAND interbedded with layer of soft damp clay.
1			B 1	1.00-1.30					
		1							1.40m: becoming wet.
2			B 2	2.00-2.30					
							48.40	2.50	
						END			TP terminated at 2.50m bgl. Unable to keep TP open - sidewall collapse.
3									
4									
5									

Remarks: TP wet from 1.40m bgl. TP backfilled with arisings.

Scale: 1:25

irish drilling

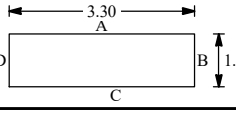
Ph.
Fax

PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-005
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,449.5 N 669,163.8
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: DRAFT
Ground level: 51.86m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.90 * 3.30m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collape from 0.50m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0			B 1	0.00-1.50					MADE GROUND: Brown fine SAND interbedded with layer of soft brown clay.
							50.36	1.50	
									MADE GROUND: Grey fine SAND.
2			B 2	2.00-2.30					
							48.86	3.00	
3			B 3	3.00-3.40					MADE GROUND: Damp grey fine SAND interbedded with layer of soft damp reddish brown clay.
							48.46	3.40	
						END			TP terminated at 3.40m bgl. Unable to keep TP open - sidewall collapse.
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:25

irish drilling

Ph.
Fax

Project ID	2021CE102		Client	RWE	Remarks
Project Name	Fahey Beg Wind Farm		Due Date	24/05/2022 11:12	
Schedule ID	2021CE102_2		Scheduled Date	24/05/2022 11:12	

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	Water soluble sulphate content of soil sample (2:1 water / soil extract)	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	
TP-001	1.00	1.30	B	1	13/05/22		1				1	1			1			1																					ALS 220706-92
TP-001	2.00	2.30	B	2	13/05/22																																		
TP-002	1.00	1.30	B	1	13/05/22																																		
TP-002	2.00	2.30	B	2	13/05/22		1	1					1					1																					ALS 220706-92
TP-002	3.00	3.30	B	3	13/05/22																																		
TP-003	1.00	1.20	B	1	13/05/22																																		
TP-003	2.00	2.20	B	2	13/05/22		1	1																															
TP-003	3.00	3.20	B	3	13/05/22																																		
TP-003	4.10	4.40	B	4	13/05/22		1	1			1	1			1			1																					ALS 220706-92
TP-004	1.00	1.30	B	1	13/05/22		1				1	1			1			1																					ALS 220706-92
TP-004	2.00	2.30	B	2	13/05/22																																		
TP-005	0.00	1.50	B	1	13/05/22						1																													
TP-005	2.00	2.30	B	2	13/05/22																																		
TP-005	3.00	3.40	B	3	13/05/22																																		

0 = test scheduled,
1 = test completed as scheduled,
0 = sample not suitable for scheduled test

Summary of Classification Test Results

Project No.: 2021CE102

Project Name: Fahey Beg 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-001	1	1.00	1.30	B		Brown sandy SILT. Sand is fine.			25.0	100					
TP-002	2	2.00	2.30	B		Brown SAND.			37.0	100					NP
TP-003	2	2.00	2.20	B		Brown SILT			44.0	100	44	26	18		MI
TP-003	4	4.10	4.40	B		Brown slightly sandy SILT. Sand is fine.			30.0	100	31	22	9		CL
TP-004	1	1.00	1.30	B		Brown very silty fine and medium SAND.			17.0	98					
TP-005	1	0.00	1.50	B		Brown slightly sandy SILT.			47.0	99					

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: 07/12/2022 00:00

QC From No: R1

Approved By:

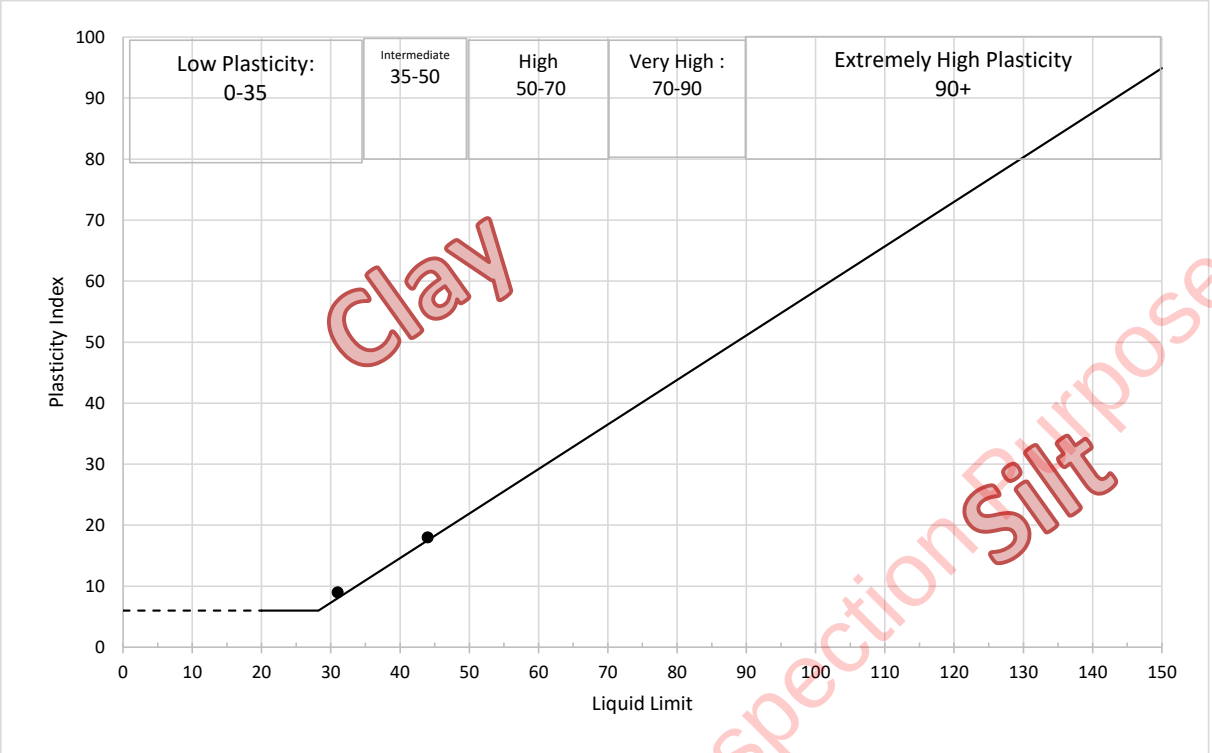
Table 1

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:	**Fahey Beg Wind Farm**	
Location:		2021CE102



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

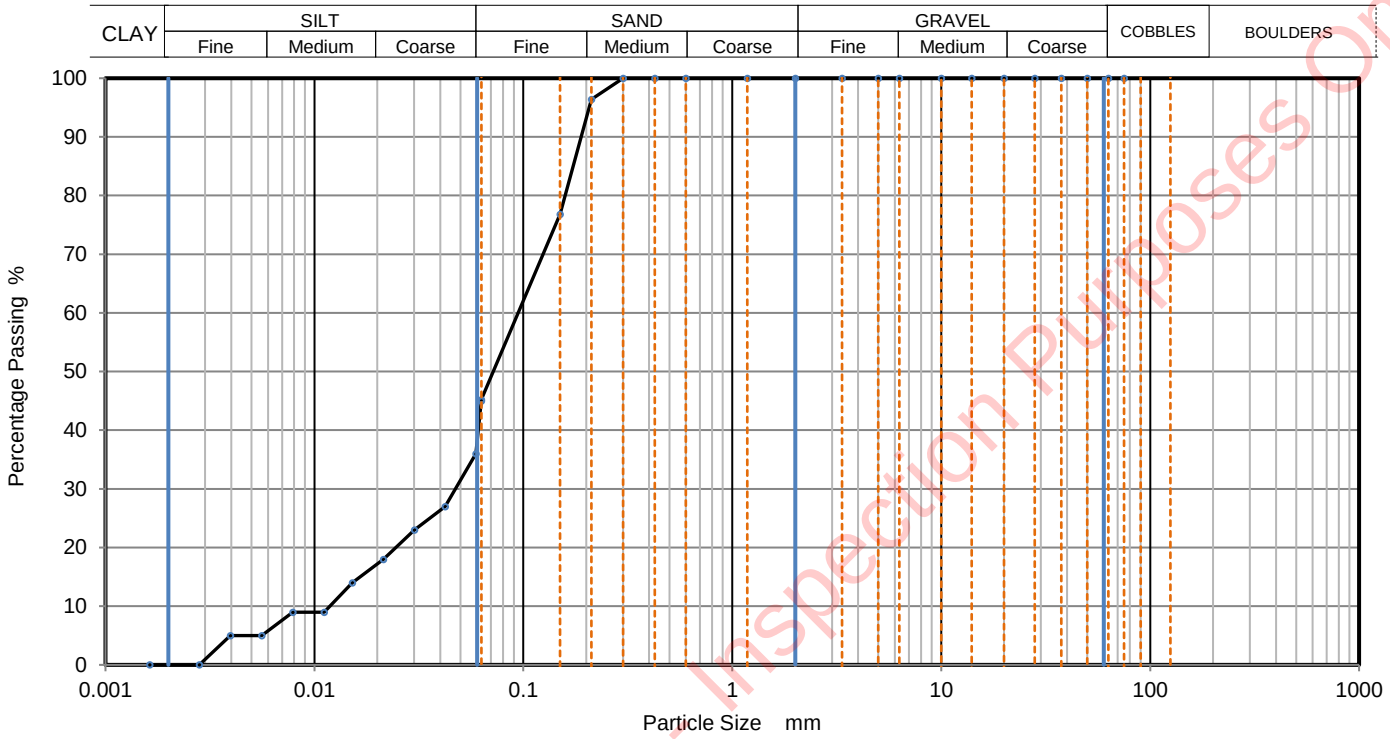
Plasticity abeviations: L = Low, I = Intermediate = H = High, V = Very High, E = Extremely High.

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	**2021CE102**
				Borehole/Pit No.	TP-001
Site Name	Fahey Beg Wind Farm			Sample No.	1
Soil Description	Brown sandy SILT. Sand is fine.			Depth, m	1.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL12022052432



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	45
		0.0592	36
75	100	0.0423	27
63	100	0.0301	23
50	100	0.0214	18
37.5	100	0.0152	14
28	100	0.0111	9
20	100	0.0079	9
14	100	0.0056	5
10	100	0.0040	5
6.3	100	0.0028	0
5	100	0.0016	0
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.65	Mg/m3
0.3	100		
0.212	96		
0.15	77		
0.063	45		

Dry Mass of sample, g	266

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	55
Silt	45
Clay	0

Grading Analysis		
D100	mm	
D60	mm	0.0947
D30	mm	0.0471
D10	mm	0.0119
Uniformity Coefficient		8
Curvature Coefficient		2

Remarks

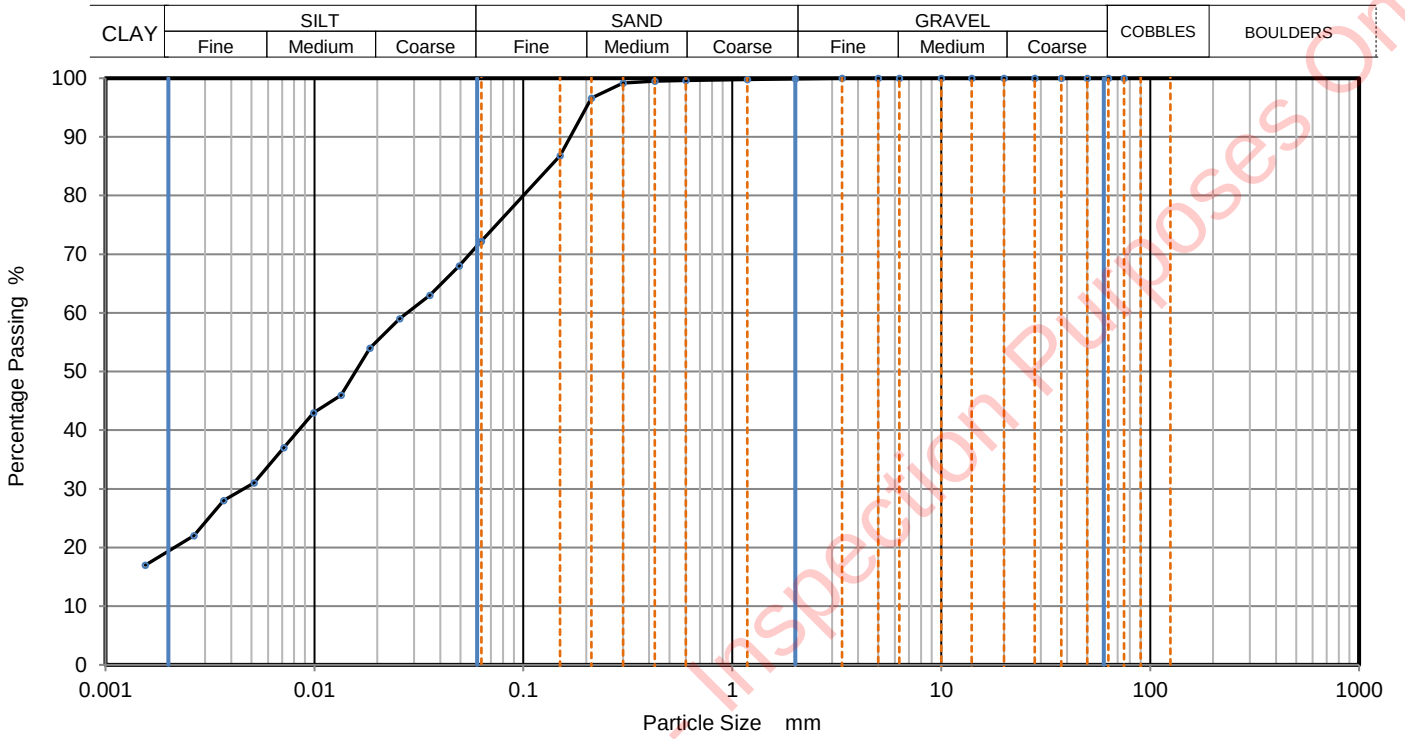
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	12/07/2022 11:22	**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	**2021CE102**
		Borehole/Pit No.	TP-003
Site Name	Fahey Beg Wind Farm	Sample No.	4
Soil Description	Brown slightly sandy SILT. Sand is fine.	Depth, m	4.10
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	KeyLAB ID	IDL12022052440



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0621	72
		0.0493	68
75	100	0.0356	63
63	100	0.0256	59
50	100	0.0185	54
37.5	100	0.0134	46
28	100	0.0099	43
20	100	0.0071	37
14	100	0.0051	31
10	100	0.0037	28
6.3	100	0.0026	22
5	100	0.0016	17
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	100	2.65 Mg/m3	
0.3	99		
0.212	97		
0.15	87		
0.063	72		

Dry Mass of sample, g	325

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	28
Silt	53
Clay	19

Grading Analysis		
D100	mm	
D60	mm	0.0274
D30	mm	0.0045
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

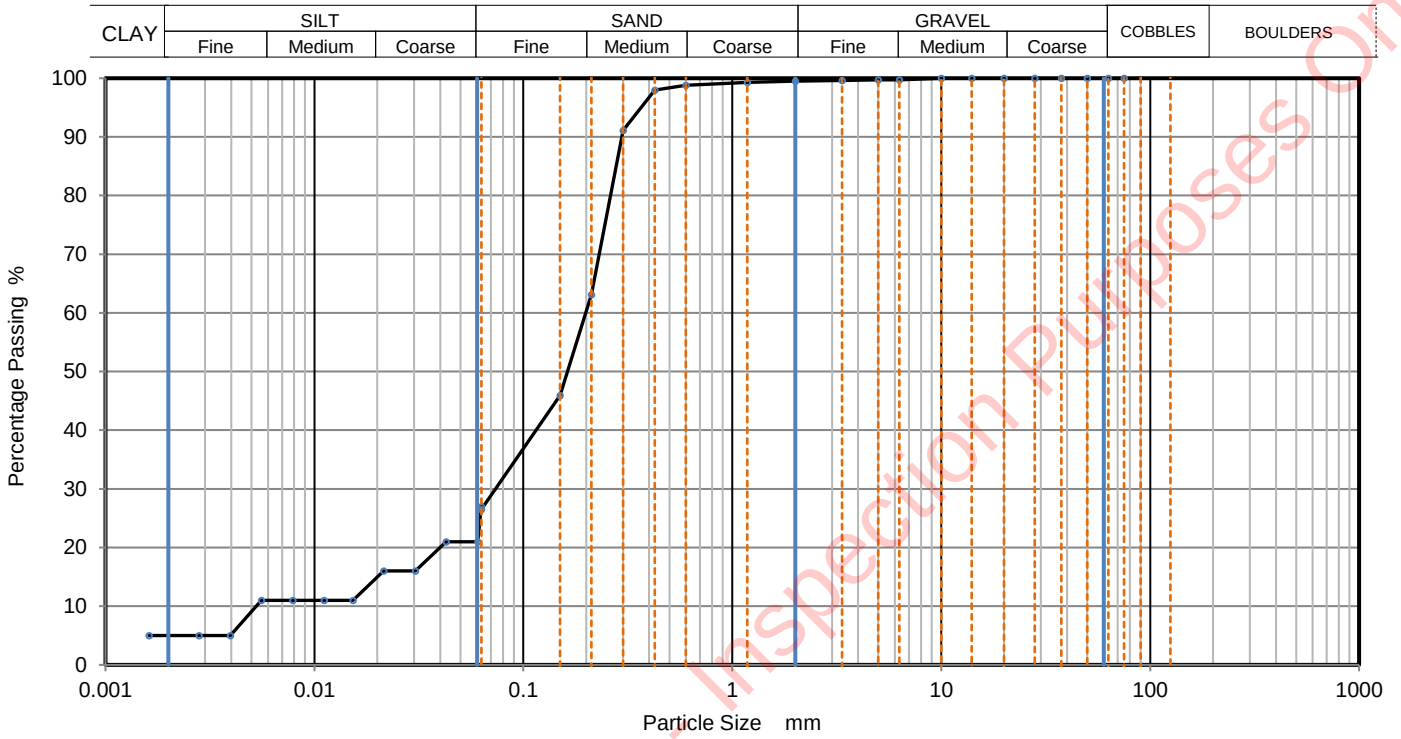
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	12/07/2022 11:22	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	**2021CE102**
		Borehole/Pit No.	TP-004
Site Name	Fahey Beg Wind Farm	Sample No.	1
Soil Description	Brown very silty fine and medium SAND.	Depth, m	1.00
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	KeyLAB ID	IDL12022052441



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	27
		0.0604	21
75	100	0.0427	21
63	100	0.0304	16
50	100	0.0215	16
37.5	100	0.0153	11
28	100	0.0111	11
20	100	0.0079	11
14	100	0.0056	11
10	100	0.0040	5
6.3	100	0.0028	5
5	100	0.0016	5
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density (assumed)	
0.425	98	2.65 Mg/m3	
0.3	91		
0.212	63		
0.15	46		
0.063	27		

Dry Mass of sample, g	363

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	73
Silt	21
Clay	5

Grading Analysis		
D100	mm	
D60	mm	0.199
D30	mm	0.0736
D10	mm	0.00536
Uniformity Coefficient		37
Curvature Coefficient		5.1

Remarks

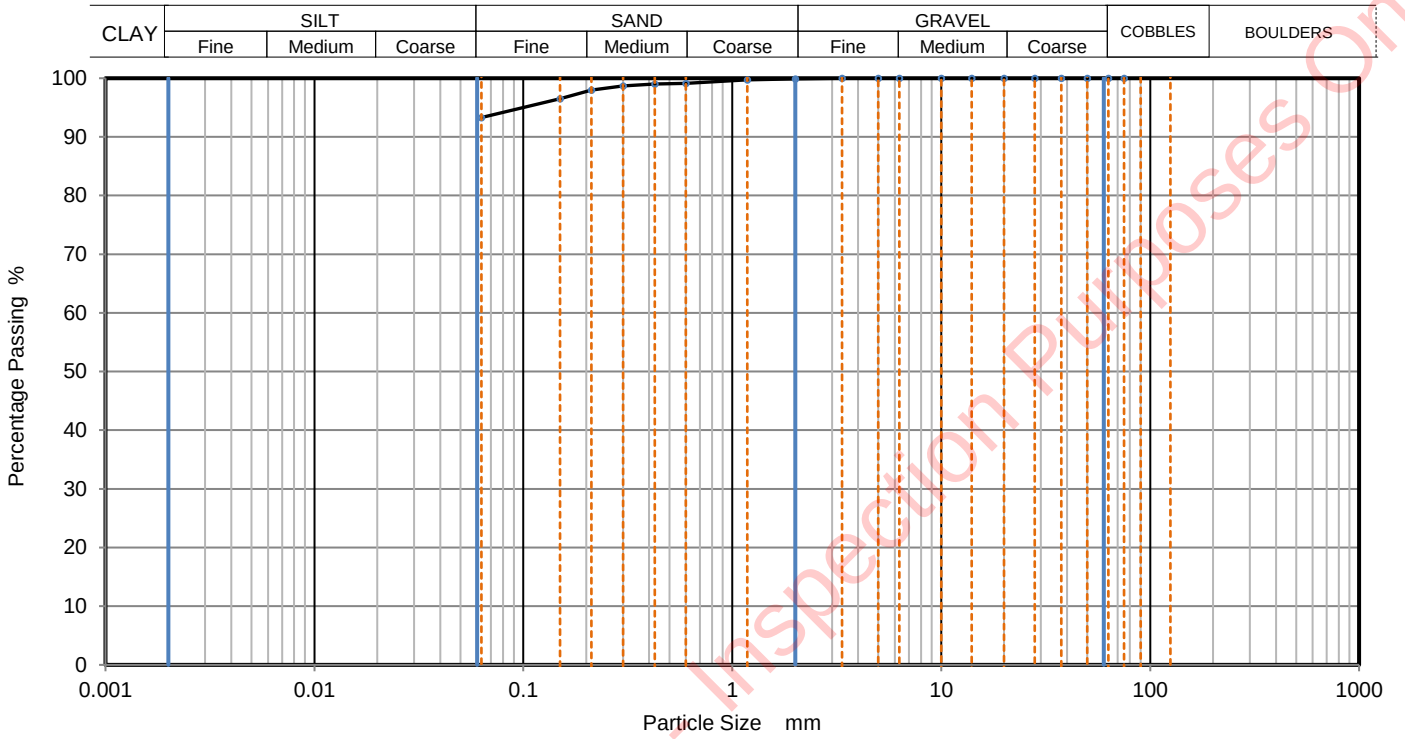
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	12/07/2022 11:22	**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	**2021CE102**
				Borehole/Pit No.	TP-005
Site Name	Fahey Beg Wind Farm			Sample No.	1
Soil Description	Brown slightly sandy SILT.			Depth, m	0.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12022052443



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	100		
1.18	100		
0.6	99		
0.425	99		
0.3	99		
0.212	98		
0.15	97		
0.063	93		

Dry Mass of sample, g	387

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	7
Fines <0.063mm	93

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.	12/07/2022 11:22	**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.

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
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Tel: (01244) 528777
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Website: www.alsenvironmental.co.uk

Irish Drilling Limited
Old Galway Road
Loughrea
Co. Galway

Attention: Dympna Darcy

CERTIFICATE OF ANALYSIS

Date of report Generation:	13 July 2022
Customer:	Irish Drilling Limited
Sample Delivery Group (SDG):	220706-92
Your Reference:	2021CE102
Location:	Faheybeg WF
Report No:	654229
Order Number:	11407

We received 4 samples on Wednesday July 06, 2022 and 4 of these samples were scheduled for analysis which was completed on Wednesday July 13, 2022. 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.

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

1291

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
26546501	TP001	B1	1.00 - 1.30	13/05/2022
26546507	TP002	B2	2.00 - 2.30	13/05/2022
26546511	TP003	B4	4.10 - 4.40	13/05/2022
26546514	TP004	B1	1.00 - 1.30	13/05/2022

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

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
			26546501	TP001	B1	1.00 - 1.30	250g Amber Jar (ALE210)	S
			26546507	TP002	B2	2.00 - 2.30	250g Amber Jar (ALE210)	S
			26546511	TP003	B4	4.10 - 4.40	250g Amber Jar (ALE210)	S
			26546514	TP004	B1	1.00 - 1.30	250g Amber Jar (ALE210)	S
Anions by Kone (soil)	All	NDPs: 0 Tests: 4	X	X	X	X		
pH	All	NDPs: 0 Tests: 4	X	X	X	X		
Sample description	All	NDPs: 0 Tests: 4	X	X	X	X		
Total Organic Carbon	All	NDPs: 0 Tests: 1		X				

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
26546501	TP001	1.00 - 1.30	Light Brown	Loamy Sand	Vegetation	None
26546507	TP002	2.00 - 2.30	Light Brown	Silty Clay	None	None
26546511	TP003	4.10 - 4.40	Light Brown	Silt Loam	None	None
26546514	TP004	1.00 - 1.30	Light Brown	Sand	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.

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

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.	TP001	TP002	TP003	TP004		
			Depth (m)	1.00 - 1.30	2.00 - 2.30	4.10 - 4.40	1.00 - 1.30		
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)		
			Date Sampled	13/05/2022	13/05/2022	13/05/2022	13/05/2022		
			Sample Time	-	-	-	-		
			Date Received	06/07/2022	06/07/2022	06/07/2022	06/07/2022		
			SDG Ref	220706-92	220706-92	220706-92	220706-92		
			Lab Sample No.(s)	26546501	26546507	26546511	26546514		
			AGS Reference	B1	B2	B4	B1		
Moisture Content Ratio (% of as received sample)	%	PM024		19	22	23	15		
Soil Organic Matter (SOM)	<0.35 %	TM132			0.795 @ #				
pH	1 pH Units	TM133		8.65 @ M	7.76 @ M	8.41 @ M	8.3 @ M		
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.01 @ M	0.0279 @ M	0.0141 @ M	0.0069 @ 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
TM243		Mixed Anions In Soils By Kone

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM).

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

Test Completion Dates

Lab Sample No(s)	26546501	26546507	26546511	26546514
Customer Sample Ref.	TP001	TP002	TP003	TP004
AGS Ref.	B1	B2	B4	B1
Depth	1.00 - 1.30	2.00 - 2.30	4.10 - 4.40	1.00 - 1.30
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	13-Jul-2022	12-Jul-2022	13-Jul-2022	13-Jul-2022
pH	11-Jul-2022	11-Jul-2022	08-Jul-2022	11-Jul-2022
Sample description	07-Jul-2022	07-Jul-2022	07-Jul-2022	07-Jul-2022
Total Organic Carbon		13-Jul-2022		

SDG:	220706-92	**Report Number:**	654229	**Superseded Report:**	
Client Ref:	2021CE102	**Location:**	Faheybeg WF		

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. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

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 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **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.

19. **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**

20. **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 (2021), 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 and soils are obtained from supplied bulk materials andd soils 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 (2021).

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.

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.

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.

Trial Pit Log

			Trialpit No **TP01** Sheet 1 of 1
Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562638.00 - 668866.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2 Depth 4.50	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25	-0.25		TOPSOIL
							Light brown, slightly clayey, gravelly SAND with some cobbles and occasional boulders, sub-angular to sub-rounded.
							More cobbles and boulders (angular to sub-rounded) present with depth.
				2.30	-2.30		Brown, clayey SAND with cobbles and some boulders (angular to sub-rounded).
							More cobbles and boulders (angular to sub-rounded) present with depth.
				4.50	-4.50		End of pit at 4.50 m

Remarks: Target depth of 4.50m achieved.

Rate of water flow: Dry.

Stability: Stable

Trial Pit Log

Trialpit No **TP02**

Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562662.00 - 668807.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 4.10	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25	-0.25		TOPSOIL
				0.90	-0.90		Light brown/orange, slightly clayey SAND with some gravel (sub-angular)
				1.30	-1.30		Reddish, slightly gravelly, sandy, CLAY.
				3.00	-3.00		Brown, very gravelly SAND with some cobbles and occasional boulders (sub-angular to sub-rounded). *More cobbles and boulders (angular to sub-rounded) present with depth.*
				4.10	-4.10		Brown, gravelly, SAND with many cobbles and some boulders (angular to sub-rounded). End of pit at 4.10 m

Remarks: Terminated at 4.10m depth due to refusal - possible boulders or bedrock.
Rate of water flow: Dry.

Stability: Stable

Trial Pit Log

Trialpit No **TP03** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562702.00 - 668850.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 3.50	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	-0.30		TOPSOIL
				0.90	-0.90		Light brown/orange, slightly gravelly, SAND.
				2.80	-2.80		Brown, slightly gravelly, SAND with some cobbles (sub-rounded to sub-angular)
				3.30	-3.30		Brown, SAND with many cobbles and boulders (sub-rounded to sub-angular)
				3.50	-3.50		Cobbles and Boulders (sub-angular) End of pit at 3.50 m

Remarks: Terminated at 3.50m depth due to refusal - possible boulders or bedrock.
Rate of water flow: Dry.

Stability: Stable

Trial Pit Log

Trialpit No **TP04** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562678.00 - 668897.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2 Depth 3.80	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40	-0.40		TOPSOIL
				2.30	-2.30		Brown, slightly gravelly, SAND with occasional cobbles (sub-angular to sub-rounded).
				3.80	-3.80		Brown, gravelly, SAND with cobbles and some boulders (angular to sub-rounded). *More cobbles and boulders (angular to sub-rounded) present with depth.* End of pit at 3.80 m

Remarks: Terminated at 3.80m depth due to refusal - possible boulders or bedrock.
Rate of water flow: Dry.

Stability: Stable.

Trial Pit Log

Trialpit No **TP05** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562614.00 - 668930.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 4.10	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	-0.30		TOPSOIL
				0.80	-0.80		Light brown/orange, slightly clayey, slightly gravelly, SAND.
				3.00	-3.00		Light brown, very gravelly , SAND with cobbles and some boulders (sub-rounded). *Gravel, cobbles and boulders (sub-angular to sub-rounded) present with depth.*
				4.10	-4.10		Brown, slightly gravelly SAND, with many cobbles and boulders (sub-angular to sub-rounded). Boulder seems to be SILTSTONE with iron staining. End of pit at 4.10 m

Remarks: Terminated at 4.10m depth due to instability of side wall.
Rate of water flow: Dry.

Stability: Instability of side wall.

Trial Pit Log

Trialpit No **TP06** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562336.00 - 669770.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 4.50	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Light brown, slightly gravelly, SAND.
							Cobbles and some boulders (sub-angular to sub-rounded) present with depth.
				3.60	-3.60		Brown, slight gravelly, SAND, with cobbles and some boulders (sub-angular to sub-rounded)
				4.50	-4.50		End of pit at 4.50 m

Remarks: Target depth of 4.50m achieved.
Rate of water flow: Dry

Stability: Stable.

Trial Pit Log

Trialpit No **TP07** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562294.00 - 669756.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 4.00	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND (Mixture of sand/capping/boulders/ gravel)
				0.60	-0.60		Light grey, slightly gravelly, SAND with occasional cobbles and boulders (sub-rounded to sub-angular).
				2.70	-2.70		Brown, slightly gravelly, SAND with cobbles and some boulders (sub-angular to sub-rounded). *Sand content reducing, with cobbles and boulders (sub-angular) becoming more frequent with depth from 3.30m.*
				4.00	-4.00		End of pit at 4.00 m

Remarks: Terminated at 4.00m depth due to refusal - possible boulders or bedrock.
Rate of water flow: Dry.

Stability: Stable.

Trial Pit Log

Trialpit No **TP08** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562303.00 - 669680.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 3.90	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25	-0.25		TOPSOIL
				0.60	-0.60		Brown, very sandy, GRAVEL.
				3.10	-3.10		Brown, slightly gravelly SAND with occasional cobbles (sub-angular to sub-rounded).
▼				3.90	-3.90		Brown, slight gravelly SAND with some cobbles and occasional boulders (sub-angular to sub-rounded). Probable Sandstone bedrock. End of pit at 3.90 m

Remarks: Terminated at 3.90m depth due to instability of side wall.
Rate of water flow: Trickle at base.

Stability: Instability of side wall.

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 9.2

Factual Ground Investigation Report

IRISH DRILLING LIMITED

LOUGHREA, CO. GALWAY, IRELAND

CONTRACT DRILLING
SITE INVESTIGATION

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

email: info@irishdrilling.ie

FAHY BEG WIND FARM

SITE INVESTIGATION CONTRACT FACTUAL REPORT

RWE,
RWE Platz 1,
45141,
Essen.

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

	Prepared by	Approved by	Rev. Issue Date:	Revision No.
	Ronan Killeen	Declan Joyce	8th August 2022	21 _CE_102/03
Signature				

FOREWORD

The 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 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 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 & Partners, Consulting Engineers, on behalf of RWE Ireland, to carry out a site investigation at the site of the proposed Fahey Beg Wind Farm Project.

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

Phase 1 fieldwork commenced on February 3rd 2022 and was completed on February 7th 2022.

Phase 2 fieldwork was carried out on May 13th 2022.

2.0 Site & Geology

The site is located southwest of Killaloe, County Clare.

The site is agricultural in nature and the fieldwork was carried out predominantly on agricultural lands.

Weather conditions in general were quite variable with the majority of the fieldwork carried out over a typical winter period in Ireland.

Geological Survey maps of the area indicate that the site is underlain by Limestone and Sandstone Rock Formations.

A Site Plan, prepared by the client's representatives to show approximate fieldwork locations, is included with this report.

3.0 Fieldwork.

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

Phase 1 Fieldwork:

1nr Kobelco 7T Tracked Excavator.

Fieldwork carried out to date has included the following:

Ten 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.

The pits were excavated to depths ranging from 0.40m to 3.00m below ground level.

Phase 2 Fieldwork:

1nr Hitachi 13T Tracked Excavator.

Fieldwork carried out to date has included the following:

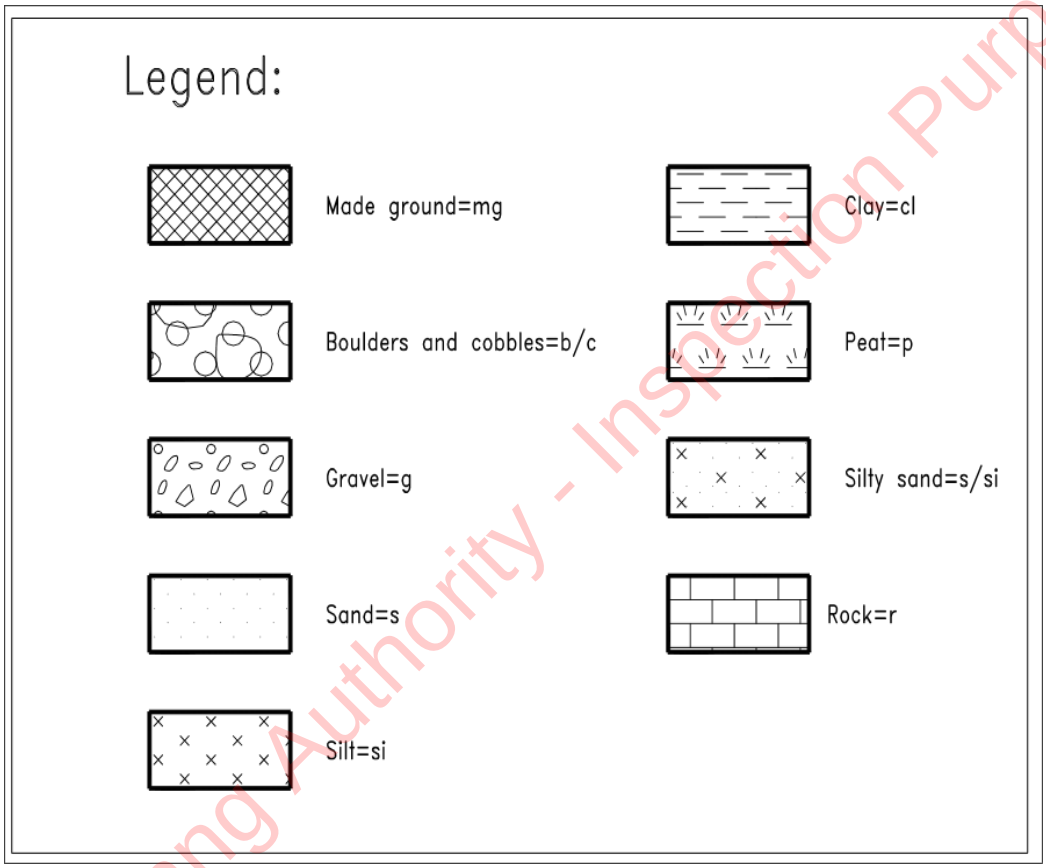
Five trial pits were excavated on site using a tracked excavator.

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.

The pits were excavated to depths ranging from 2.30m to 3.40m below ground level.

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 bedrock.

The Glacial Tills in general consisted of grey and brown slightly gravelly sandy silt with cobbles and boulders and/or silty clayey sandy gravel with cobbles and boulders.

Possible weathered bedrock was also encountered at trial pit T005 while a number of trial pits encountered 'refusal' on possible bedrock at relatively shallow depths.

Phase 2 fieldwork operations encountered possible made ground to depths of up to 3.40m and predominantly consisted of silty sands interbedded with silt/clay. It is possible that the area where the trial pits were excavated was previously used as a settlement pond for an adjacent quarry.

For detailed descriptions of the ground conditions encountered please refer to the engineering logs included as Appendix 1 and Appendix 1a of this report.

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 fieldwork 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.

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 Representative and included some or all of the following tests on disturbed soil samples:

* Moisture Content.
* Atterberg Limits.
* Particle Size Distribution.
* Sedimentation.
* Chemical (pH, Sulphate).
* Organic Content.

The records of these laboratory tests results are included as Appendix 2 and Appendix 2a of this factual report.

The soil descriptions as noted on the 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
Chartered Engineer
Irish Drilling Limited
July 19th 2022

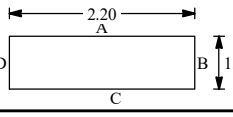
Appendix 01
Trial Pit Records

PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-C1
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,569.6 N 668,946.8
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 48.96m O.D.	**DATE:** 3.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.50m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 1.10 * 2.20m
LOGGED BY: MM



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									Reeds over very soft wet slightly sandy organic silty CLAY. Sand is fine.
1			B 1	1.00					
		1					47.46	1.50	Fast water inflow from base of pit at 1.50m depth.
						END			TP terminated at 1.50m bgl. Unable to progress TP - sidewall collapse.
2									
3									
4									
5									

Remarks: Ingress of water at 1.50m bgl. TP backfilled with arisings.

Scale: 1:25

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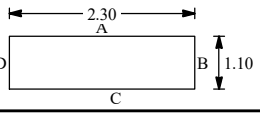
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-S1
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,539.6 N 668,774.4
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 45.19m O.D.	**DATE:** 3.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.70m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 1.10 * 2.30m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									Reeds over very soft wet grey silty CLAY.
			B 1	1.70-2.20			43.49	1.70	Wet rounded to subrounded BOULDERS and rounded to subrounded COBBLES with a bluish grey sandy rounded to subrounded fine to coarse gravel infill. Sand is coarse. Fast water inflow at 1.70m depth.
2						END	42.99	2.20	TP terminated at 2.20m bgl. Unable to progress TP - ingress of water.
5									

Remarks: Ingress of water at 1.70m bgl. TP backfilled with arisings.

Scale: 1:25

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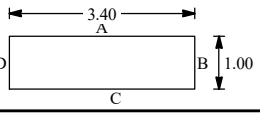
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T001
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,039.4 N 670,613.5
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 115.36m O.D.	**DATE:** 3.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.80m
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 1.00 * 3.40m
LOGGED BY: MM



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							115.01	0.35	Grass over firm grey TOPSOIL with rootlets.
							114.46	0.90	Firm orangish grey slightly gravelly sandy SILT. Sand is medium. Gravel is rounded to subrounded fine to medium.
1									Stiff damp grey slightly gravelly sandy SILT. Gravel is angular to rounded of siltstone and shale.
		▼1							Fast water inflow from southeast corner of pit at 1.80m depth.
2			B 1	2.40-2.70					
							112.36	3.00	
3						END			TP terminated at 3.00m bgl. Unable to make progress - hard digging.
4									
5									

Remarks: Ingress of water at 1.80m bgl. TP backfilled with arisings.

Scale: 1:25

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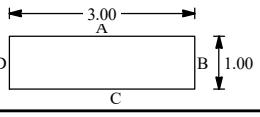
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T002
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,245.5 N 670,310.0
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 142.32m O.D.	**DATE:** 3.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.00 * 3.00m
LOGGED BY: MM



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							142.02	0.30	Grass over firm brown gravelly SILT. Gravel is angular to subangular fine to medium.
							141.72	0.60	Brownish orange gravelly SILT.
			B 1	0.60-1.00			141.32	1.00	Brown silty clayey very sandy GRAVEL with traces of rootlets. Gravel is fine to medium.
1									1.00m: with low cobble content. Cobbles are flat and angular to subangular of shale siltstone and sandstone. Stiff grey gravelly sandy SILT. Sand is fine to medium. Gravel is rounded to subangular fine to coarse.
2			B 2	1.80-2.00			139.82	2.50	
						END			TP terminated at 2.50m bgl. Unable to make progress - hard digging.
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:25

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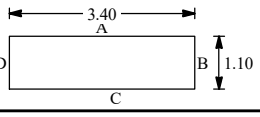
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T003
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,748.2 N 669,959.3
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 154.07m O.D.	**DATE:** 4.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 0.00m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.10 * 3.40m
LOGGED BY: MM



Shoring/Support: N/A
Stability:

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							153.67	0.40	TOPSOIL: Grass over firm brown slightly sandy gravelly SILT. Water seepage from GL to 1.00m depth observed (pit sides).
1									Firm grey mottled orange slightly sandy gravelly SILT interbedded with layers of blackish angular to subrounded gravel and cobbles. 1.00m to 1.60m: large boulder within southern face of TP.
			B 1	1.60-2.00			152.47	1.60	
2									Stiff bluish grey slightly sandy gravelly SILT/CLAY with low cobble content. Gravel is rounded to subangular fine to medium.
							151.57	2.50	
							END		TP terminated at 2.50m bgl. Obstruction as possible rock or boulder.
3									
4									
5									

Remarks: Ingress of water from g/l to 1.00m bgl. TP backfilled with arisings.

Scale: 1:25

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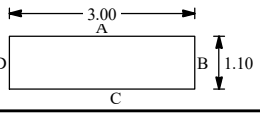
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T004
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,872.0 N 669,577.9
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 125.32m O.D.	**DATE:** 4.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.80m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.10 * 3.00m
LOGGED BY: MM



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							125.12	0.20	TOPSOIL: Grass over firm brown SILT.
							124.62	0.70	Firm brown gravelly SILT. Gravel is angular to subrounded.
1			B 1	0.70-1.00			123.62	1.70	Firm grey mottled orange slightly sandy gravelly SILT with low cobble content. Gravel is angular to subrounded of shale and sandstone. Cobbles are rounded to subangular of sandstone.
2		▼	B 2	1.70-2.30			123.02	2.30	Pinkish brown silty very sandy GRAVEL with low boulder content. Gravel is rounded to subangular fine to medium. Slight water seepage from pit side walls observed at 1.80m depth.
									END TP terminated at 2.30m bgl. Unable to make progress - hard digging.
3									
4									
5									

Remarks: Ingress of water at 1.80m bgl. TP backfilled with arisings.

Scale: 1:25

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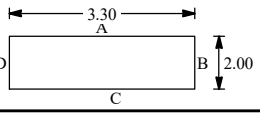
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T005
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 563,791.9 N 670,570.4
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: m O.D.	**DATE:** 7.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 090-270
PIT DIMENSION: 2.00 * 3.30m
LOGGED BY: MM



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								0.20	TOPSOIL: Grass roots and briars over firm brown gravelly SILT with boulder. Boulders are rounded to subrounded of sandstone.
								0.40	Possible rock. Recovered as flat and angular sandstone clasts with orange sandy gravel infill.
			B 1	0.40		END			TP terminated at 0.40m bgl. Obstruction as probable rock.
1									
2									
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.
Unable to survey due to dense foliage - location set out using handhelkd GPS and with co-ordinates as received from client's representatives.

Scale: 1:25

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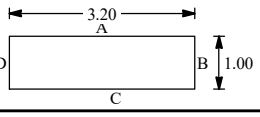
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T006
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 564,167.0 N 670,388.7
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: m O.D.	**DATE:** 7.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.00 * 3.20m
LOGGED BY: MM



Shoring/Support: N/A
Stability:

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0								0.38	TOPSOIL: Grass and briars over firm damp brown silty CLAY.
								1.20	Firm grey mottled orange slightly sandy gravelly SILT. Gravel is angular to subangular fine to medium of shale.
1			B 1	1.20-1.80					
								2.10	Stiff damp blue mottled grey slightly sandy gravelly silty CLAY. Gravel is fine to coarse of siltstone and shale.
2			B 2	2.10-2.70					
								2.70	Pinkish grey brown silty sandy GRAVEL with traces of rootlets. Gravel is fine to coarse, angular to subangular.
						END			TP terminated at 2.70m bgl. Obstruction as possible slate rock.
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.
Unable to record reduced level due to foliage.

Scale: 1:25

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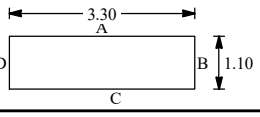
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T007
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 564,519.2 N 670,704.2
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: m O.D.	**DATE:** 7.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 320-140
PIT DIMENSION: 1.10 * 3.30m
LOGGED BY: MM



Shoring/Support: N/A
Stability:

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									Grass and tree roots over firm grey mottled orange slightly sandy sightly gravelly SILT.
								1.00	
1			B 1	1.00-1.50					Brown mottled grey silty clayey very sandy GRAVEL. Gravel is fine to coarse.
								1.50	
									Stiff bluish grey slightly sandy slightly gravelly CLAY. Gravel is flat and angular to subangular of shale.
2									1.90m: with high boulder content. Boulders are rounded to subrounded of sandstone and siltstone.
								2.30	
						END			TP terminated at 2.30m bgl. Obstruction as possible rock.
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.
Unable to record reduced level due to foliage.

Scale: 1:25

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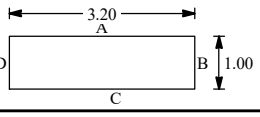
PROJECT: Fahy Beg Wind Farm	**TRIALPIT:** TP-T008
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 564,593.3 N 670,291.8
ENGINEER: Fehily Timoney	**Rig:** 7T Tracked Kobelco
	Rev: FINAL
Ground level: 157.16m O.D.	**DATE:** 7.2.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 040-230
PIT DIMENSION: 1.00 * 3.20m
LOGGED BY: MM



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									
							156.96	0.20	TOPSOIL: Grass over firm brown gravelly SILT.
							156.66	0.50	TOPSOIL: Firm brownish orange sandy SILT.
1			B 1	0.50-1.00			155.66	1.50	Pinkish grey brown silty clayey very sandy GRAVEL with low cobble content and medium boulder content. Gravel is angular to subangular of shale and siltstone. Traces of rootlets.Gravel is fine to coarse.
							155.36	1.80	Blocky and angular to subrounded COBBLES and blocky and angular to subrounded BOULDERS with a silty gravelly infill.
2						END			TP terminated at 1.80m bgl. Obstruction as possible rock.
3									
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:25

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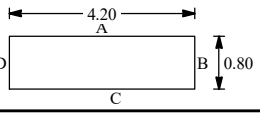
Appendix 01a
Trial Pit Records (Phase 2)

PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-A1
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,388.0 N 669,132.1
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: FINAL
Ground level: 51.07m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: 2.30m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 0.80 * 4.20m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									
							50.47	0.60	MADE GROUND: Small trees and grass over grey fine SAND.
1			B 1	1.00-1.30					MADE GROUND: Soft wet greyish brown sandy silty CLAY interbedded with layers of wet fine sand.
2		▼	B 2	2.00-2.30			48.77	2.30	
						END			TP terminated at 2.30m bgl. Unable to keep TP open - sidewall collapse and ingress of water.
3									
4									
5									

Remarks: Ground level may be incorrect due to extensive tree cover. Ingress of water at 2.30m bgl. TP backfilled with arisings.

Scale: 1:25

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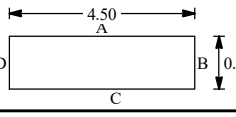
PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-A2
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,377.9 N 669,103.9
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: FINAL
Ground level: 50.49m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: 3.40m
2nd:
3rd:

PIT DIRECTION: 140-320
PIT DIMENSION: 0.80 * 4.50m
LOGGED BY: MM



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							49.69	0.80	MADE GROUND: Grass and shrubs over grey fine SAND.
1			B 1	1.00-1.30					MADE GROUND: Very soft damp grey organic clayey SILT and brown SAND with 5 to 10mm rootlets.
2			B 2	2.00-2.30			47.59	2.90	2.00m: becoming bluish grey. 2.40m: becoming wet.
3		▼1	B 3	3.00-3.30			47.09	3.40	MADE GROUND: Very soft wet grey clayey SILT interbedded with layers of wet orange fine sand.
4						END			TP terminated at 3.40m bgl. Unable to keep TP open - sidewall collapse and ingress of water.
5									

Remarks: Ingress of water at 3.40m bgl. TP backfilled with arisings.

Scale: 1:25

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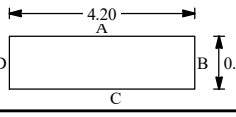
PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT: TP-A3**
LOCATION: Killaloe, Co. Clare	**Sheet 1 of 1**
CLIENT: RWE	**Co-ordinates:** E 562,413.7 N 669,079.4 — **Rig: 13T Hitachi**
ENGINEER: Fehily Timoney	**Rev: FINAL**
Ground level: 50.35m O.D.	**DATE: 13.5.22**

GROUNDWATER

Water strikes: Rose to after:
1st: 4.10m
2nd:
3rd:

PIT DIRECTION: 320-140
PIT DIMENSION: 0.80 * 4.20m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collape from 2.50m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0							49.85	0.50	MADE GROUND: Grass and shrubs over firm brown CLAY with rootlets.
1			B 1	1.00-1.20					MADE GROUND: Very soft wet reddish brown SILT/CLAY with rootlets.
2			B 2	2.00-2.20			47.85	2.50	1.80m: becoming greyish brown.
3			B 3	3.00-3.20					MADE GROUND: Very soft greyish brown SILT/CLAY interbedded with layers of wet grey medium sand.
4			B 4	4.10-4.40			45.85	4.50	
5						END			TP terminated at 4.50m bgl.

Remarks: Ingress of water at 4.10m bgl. TP backfilled with arisings.

Scale: 1:25

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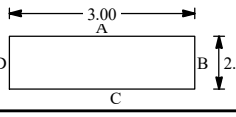
PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-A4
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,454.9 N 669,119.9
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: FINAL
Ground level: 50.90m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: 1.40m
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 2.80 * 3.00m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collape from 2.50m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0									MADE GROUND: Grey fine SAND interbedded with layer of soft damp silt/clay.
1		1	B 1	1.00-1.30					1.40m: becoming wet.
2			B 2	2.00-2.30			48.40	2.50	
						END			TP terminated at 2.50m bgl. Unable to keep TP open - sidewall collapse.
3									
4									
5									

Remarks: TP wet from 1.40m bgl. TP backfilled with arisings.

Scale: 1:25

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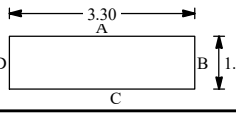
PROJECT: Fahybeg Wind Farm - Additional Works	**TRIALPIT:** TP-A5
LOCATION: Killaloe, Co. Clare	**Sheet** 1 of 1
CLIENT: RWE	**Co-ordinates:** E 562,449.5 N 669,163.8
ENGINEER: Fehily Timoney	**Rig:** 13T Hitachi
	Rev: FINAL
Ground level: 51.86m O.D.	**DATE:** 13.5.22

GROUNDWATER

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

PIT DIRECTION: 000-180
PIT DIMENSION: 1.90 * 3.30m
LOGGED BY: MM



Shoring/Support: N/A
Stability: Pit unstable. Sidewall collape from 0.50m bgl.

Depth (m)	Date	Water	Samples	Depth (m)	In-situ Vane Tests	LEGEND	Elevation m O.D.	Depth (m)	DESCRIPTION
0			B 1	0.00-1.50					MADE GROUND: Brown fine SAND interbedded with layer of soft brown silt/clay.
							50.36	1.50	
									MADE GROUND: Grey fine SAND.
2			B 2	2.00-2.30					
							48.86	3.00	
3			B 3	3.00-3.40					MADE GROUND: Damp grey fine SAND interbedded with layer of soft damp reddish brown clay.
							48.46	3.40	
						END			TP terminated at 3.40m bgl. Unable to keep TP open - sidewall collapse.
4									
5									

Remarks: TP dry on excavation. TP backfilled with arisings.

Scale: 1:25

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Appendix 02
Laboratory Test Results

Project ID	2021CE103R	Client	RWE	Remarks	Turnarou
Project Name	**Fahey Beg Wind Farm**	Report date	19/02/2022		
Schedule ID	2021CE103R_1	Scheduled Date	16/02/2022		

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	Water soluble sulphate content of soil sample (2:1 water / soil extract)	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							
TP-C1	1.00		B	1	03/02/22		1				1	1																																		
TP-S2	1.70	2.20	B	1	03/02/22																																									
TP-T001	2.40	2.70	B	1	03/02/22																																								
TP-T002	0.60	1.00	B	1	03/02/22		1				1				1				1																										
TP-T002	1.80	2.00	B	2	03/02/22																																								
TP-T003	1.60	2.00	B	1	04/02/22						1																																		
TP-T004	0.70	1.00	B	1	04/02/22																																								
TP-T004	1.70	2.30	B	2	04/02/22						1	1																																		
TP-T005	0.40		B	1	07/02/22																																									
TP-T006	1.20	1.80	B	1	07/02/22		1				1	1			1				1																										
TP-T006	2.10	2.70	B	2	07/02/22						1																																		
TP-T007	1.00	1.50	B	1	07/02/22						1				1				1																										
TP-T008	0.50	1.00	B	1	04/02/22						1																																		
	Completed in K4 Soils						3				8	3			3				3																										

0 = test scheduled,
1 = test completed,
0* = sample not suitable for scheduled test

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
31592	Fahey Beg Wind Farm	Samples received	21/03/2022
		Schedule received	10/03/2022
Project No.	Client	Project started	22/03/2022
2021CE103R	Irish Drilling	Testing Started	

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
TP-C1	1	1.00	-	B	Brown mottled grey slightly organic slightly fine sandy clayey SILT	34	-	-	-	-	NMC Only
TP-T002	1	0.60	1.00	B	Brown silty clayey very sandy GRAVEL with traces of fine rootlets (gravel is fmc slate fragments)	14	-	-	-	-	NMC Only
TP-T006	1	1.20	1.80	B	Brown slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-angular)	13	-	-	-	-	NMC Only

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3 and 5.0
These results only apply to the items tested

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Test Report by K4 SOILS LABORATORY
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Watford Herts WD18 9RU

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Email: James@k4soils.com

Checked and Approved

Initials J.P

Date: 13/04/2022

2519

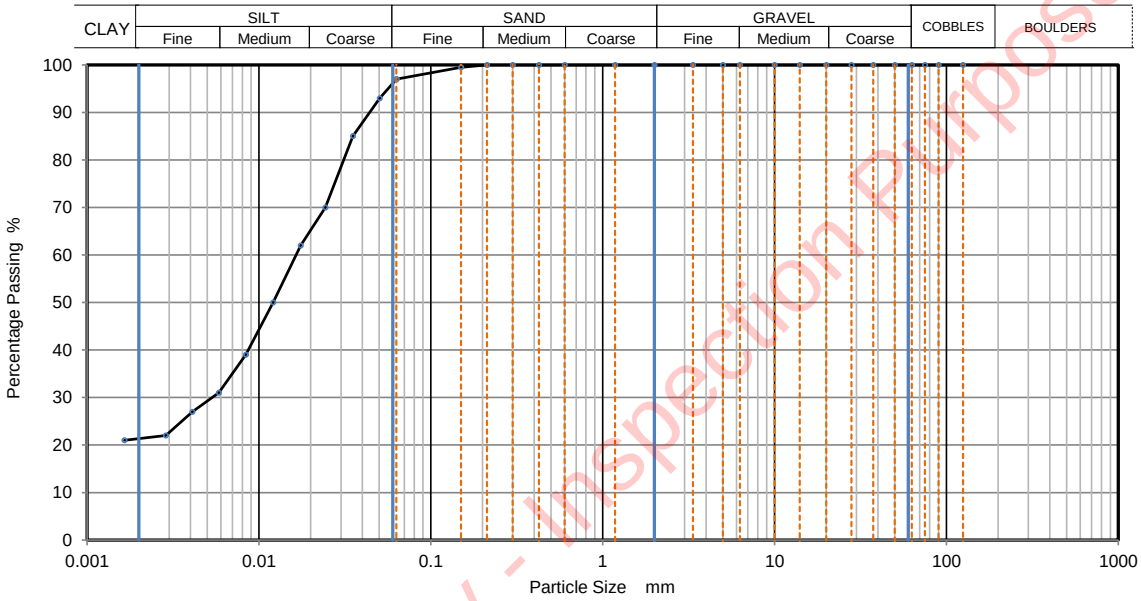
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R1(b)

PARTICLE SIZE DISTRIBUTION

				Job Ref	31592
				Borehole/Pit No.	TP-C1
Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.00 m
Soil Description	Brown mottled grey slightly organic slightly fine sandy clayey SILT			Depth Base	- m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	97
90	100	0.0505	93
75	100	0.0352	85
63	100	0.0243	70
50	100	0.0175	62
37.5	100	0.0121	50
28	100	0.0084	39
20	100	0.0058	31
14	100	0.0041	27
10	100	0.0029	22
6.3	100	0.0016	21
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.70	Mg/m3
0.3	100		
0.212	100		
0.15	100		
0.063	97		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.0
Sand	3.0
Silt	75.9
Clay	21.1

Grading Analysis		
D100	mm	
D60	mm	0.0165
D30	mm	0.00525
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

K4 Soils Laboratory

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Email: james@k4soils.com
Tel: 01923 711288

UKAS TESTING 2519

Checked and Approved

Initials: J.P

Date: 13/04/2022

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

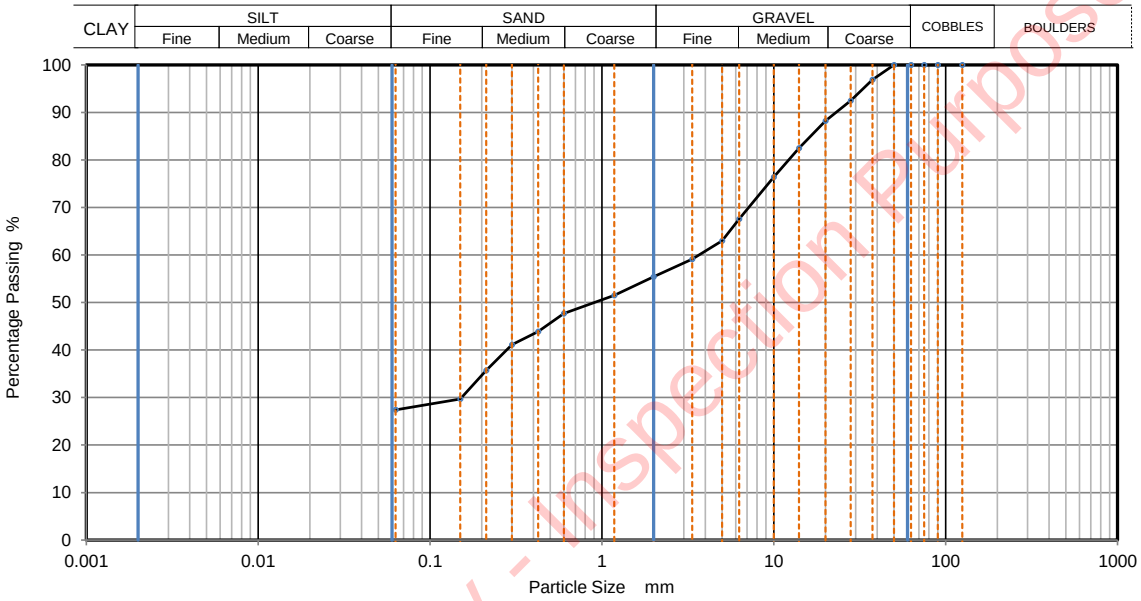
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	0.60 m
Soil Description	Brown silty clayey very sandy GRAVEL with traces of fine rootlets (gravel is fmc slate fragments)			Depth Base	1.00 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T002

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	97		
28	93		
20	88		
14	83		
10	76		
6.3	68		
5	63		
3.35	59		
2	55		
1.18	52		
0.6	48		
0.425	44		
0.3	41		
0.212	36		
0.15	30		
0.063	27		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	44.6
Sand	28.0
Fines <0.063mm	27.4

Grading Analysis		
D100	mm	
D60	mm	3.69
D30	mm	0.153
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Checked and Approved

Initials: J.P

Date: 13/04/2022

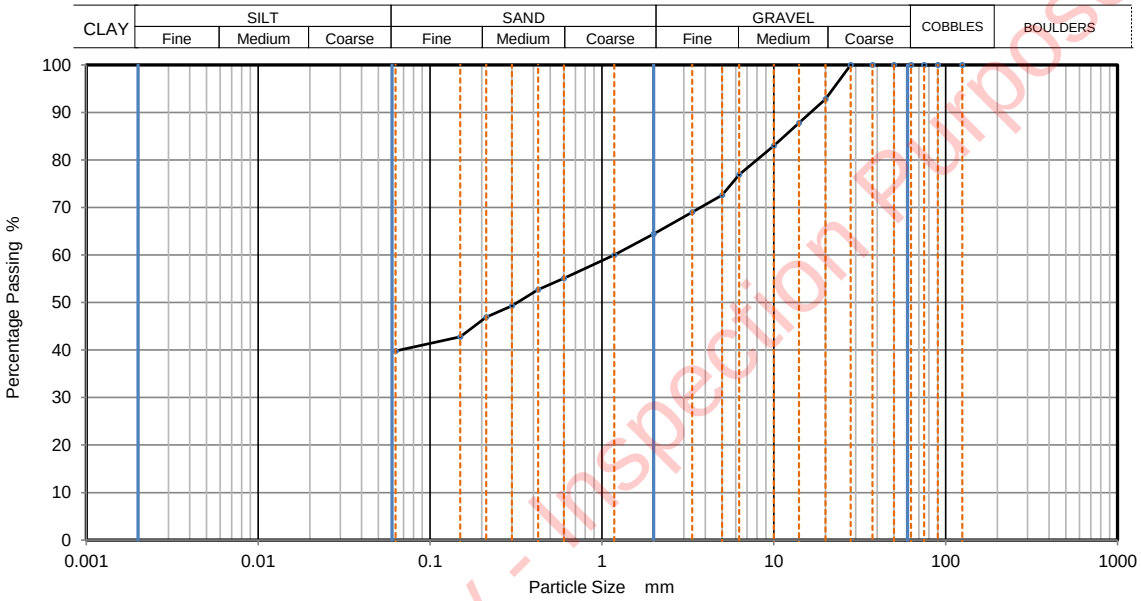
MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.60 m
Soil Description	Brown slightly mottled grey slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-rounded)			Depth Base	2.00 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592
Borehole/Pit No.: TP-T003

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	93		
14	88		
10	83		
6.3	77		
5	73		
3.35	69		
2	64		
1.18	60		
0.6	55		
0.425	53		
0.3	49		
0.212	47		
0.15	43		
0.063	40		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	35.6
Sand	24.6
Fines <0.063mm	39.8

Grading Analysis		
D100	mm	
D60	mm	1.18
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Checked and Approved

Initials: J.P

Date: 13/04/2022

MSF-5-R3

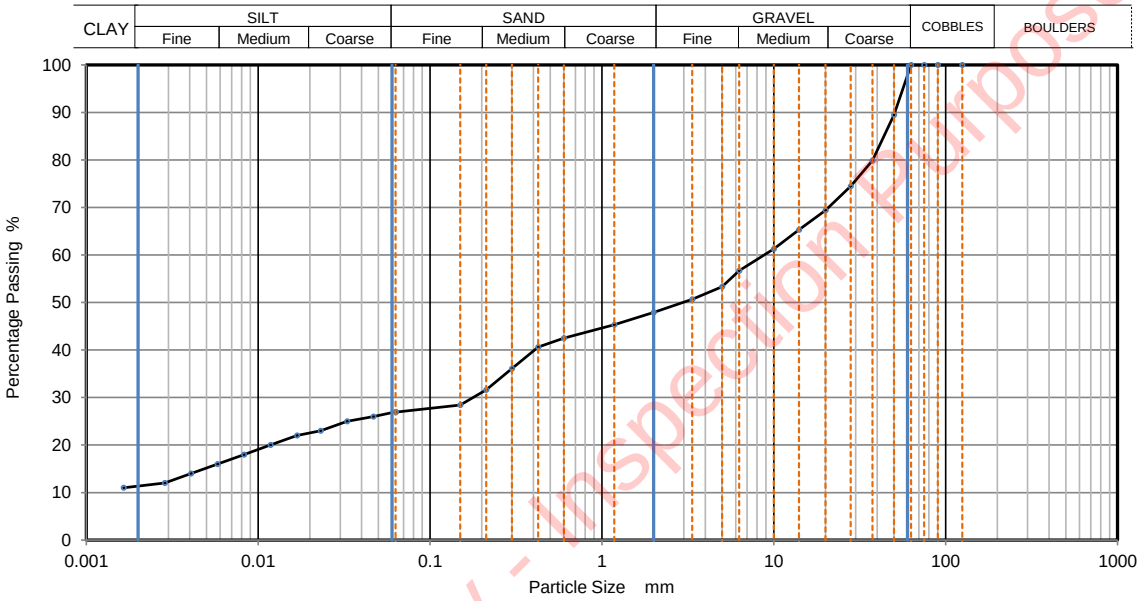
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	2
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.70 m
Soil Description	Brown clayey silty very sandy GRAVEL (gravel is fmc and angular to sub-angular)			Depth Base	2.30 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T004

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	27
90	100	0.0467	26
75	100	0.0329	25
63	100	0.0231	23
50	90	0.0168	22
37.5	80	0.0118	20
28	75	0.0083	18
20	69	0.0058	16
14	65	0.0041	14
10	61	0.0029	12
6.3	57	0.0016	11
5	53		
3.35	51		
2	48		
1.18	45		
0.6	43	Particle density (assumed)	
0.425	41	2.70 Mg/m3	
0.3	36		
0.212	32		
0.15	28		
0.063	27		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	52.1
Sand	21.0
Silt	15.4
Clay	11.5

Grading Analysis		
D100	mm	
D60	mm	8.76
D30	mm	0.178
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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Checked and Approved

Initials: J.P

Date: 13/04/2022

MSF-5-R3

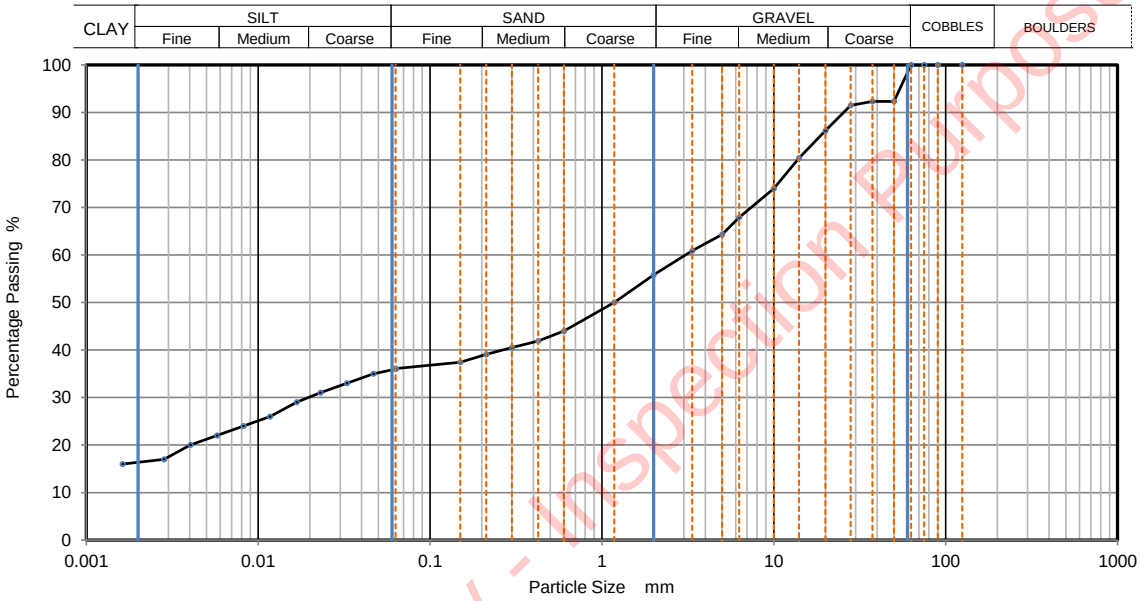
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.20 m
Soil Description	Brown slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-angular)			Depth Base	1.80 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T006

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	36
90	100	0.0468	35
75	100	0.0328	33
63	100	0.0230	31
50	92	0.0168	29
37.5	92	0.0117	26
28	92	0.0082	24
20	86	0.0058	22
14	80	0.0040	20
10	74	0.0028	17
6.3	68	0.0016	16
5	64		
3.35	61		
2	56		
1.18	50		
0.6	44	Particle density (assumed)	
0.425	42	2.70 Mg/m3	
0.3	41		
0.212	39		
0.15	37		
0.063	36		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	44.2
Sand	19.7
Silt	20.1
Clay	16.0

Grading Analysis		
D100	mm	
D60	mm	3.05
D30	mm	0.0194
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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Checked and Approved

Initials: J.P

Date: 13/04/2022

MSF-5-R3

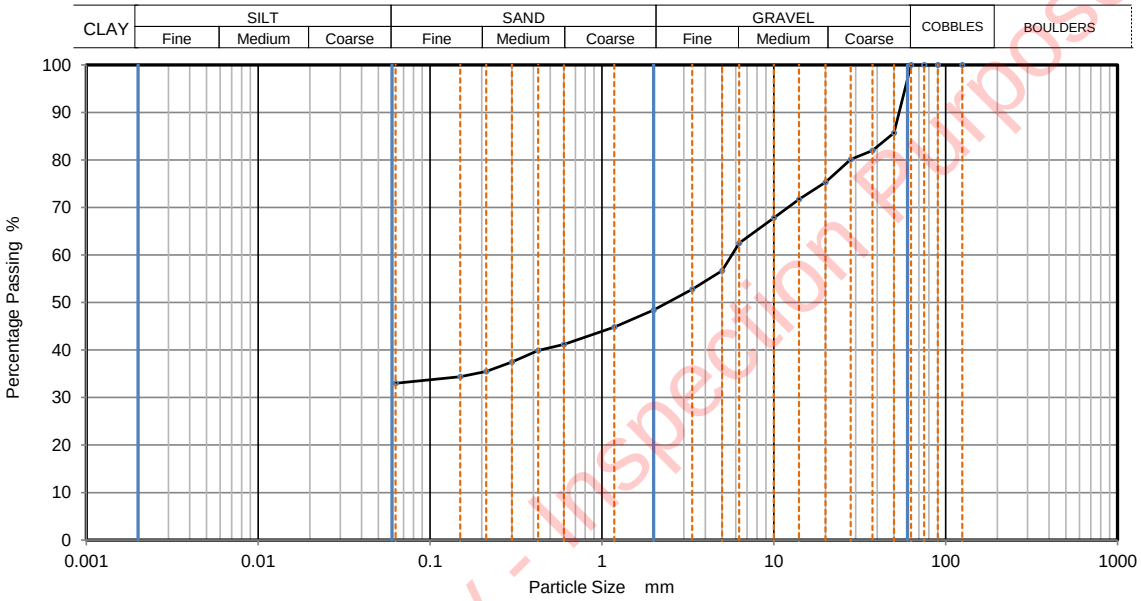
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	2
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	2.10 m
Soil Description	Brown silty clayey sandy GRAVEL with occasional fine rootlets (gravel is fmc and angular to sub-angular)			Depth Base	2.70 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T006

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	86		
37.5	82		
28	80		
20	75		
14	72		
10	68		
6.3	63		
5	57		
3.35	53		
2	48		
1.18	45		
0.6	41		
0.425	40		
0.3	38		
0.212	36		
0.15	34		
0.063	33		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	51.6
Sand	15.4
Fines <0.063mm	33.0

Grading Analysis		
D100	mm	
D60	mm	5.71
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Checked and Approved

Initials: J.P

Date: 13/04/2022

MSF-5-R3

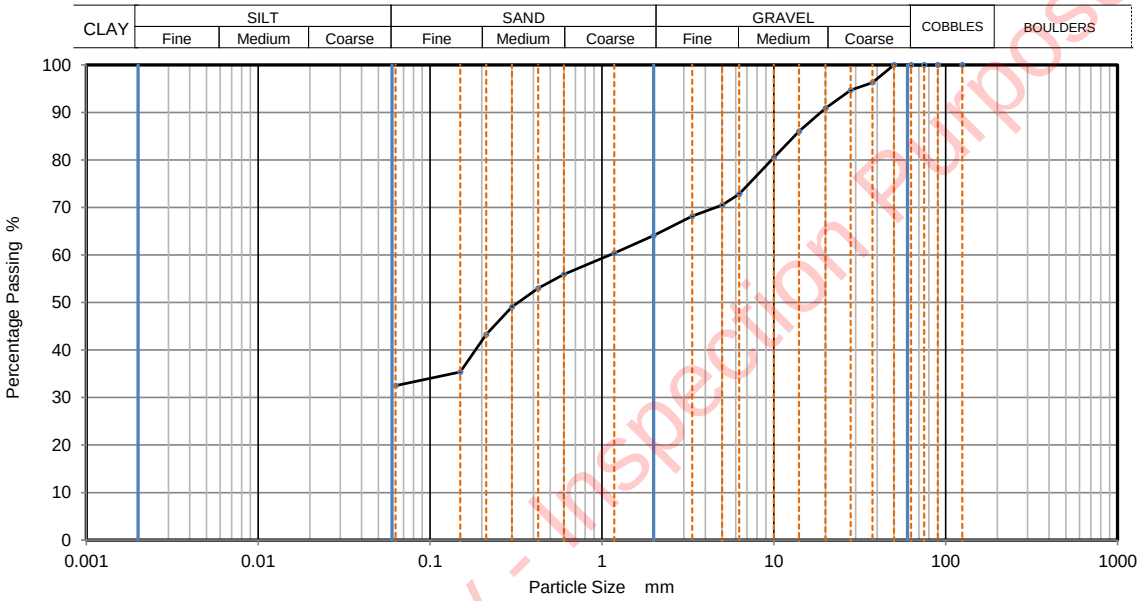
PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Sample No.	1
Project No.	2021CE103R	Client	Irish Drilling	Depth Top	1.00 m
Soil Description	Brown mottled grey silty clayey very sandy GRAVEL (gravel is fmc slate fragments)			Depth Base	1.50 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
				Date tested	12/04/2022

Job Ref: 31592

Borehole/Pit No.: TP-T007

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	96		
28	95		
20	91		
14	86		
10	81		
6.3	73		
5	71		
3.35	68		
2	64		
1.18	60		
0.6	56		
0.425	53		
0.3	49		
0.212	43		
0.15	35		
0.063	33		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	35.9
Sand	31.6
Fines <0.063mm	32.5

Grading Analysis		
D100	mm	
D60	mm	1.12
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

K4 Soils Laboratory

Unit 8, Olds Close, Watford, Herts, WD18 9RU

Email: james@k4soils.com

Tel: 01923 711288

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

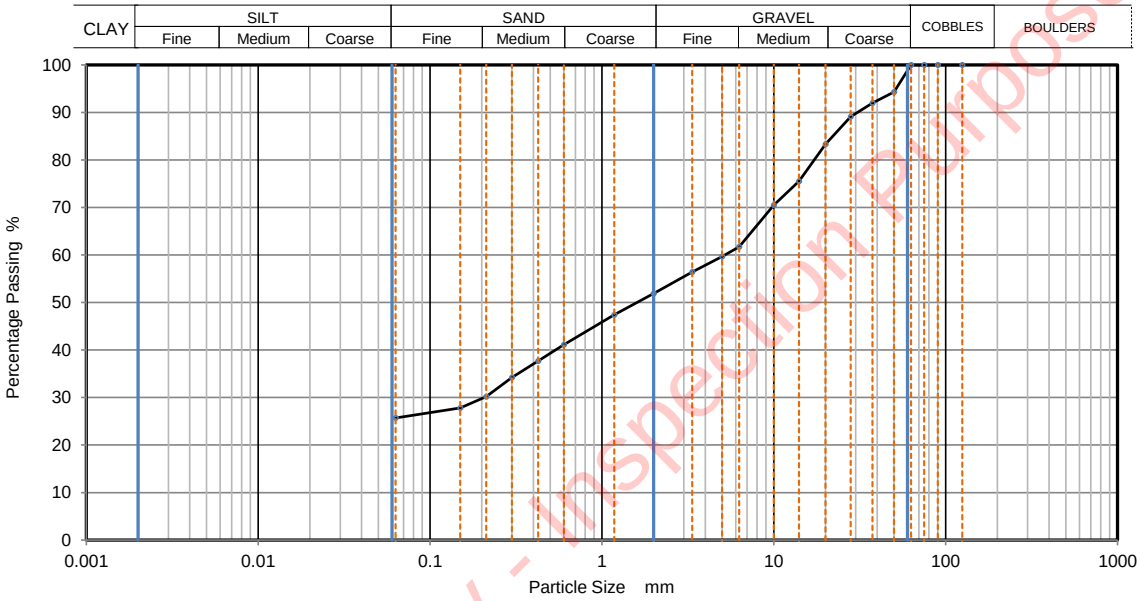
Checked and Approved

Initials: J.P

Date: 13/04/2022

PARTICLE SIZE DISTRIBUTION

Site Name	Fahey Beg Wind Farm			Job Ref	31592
				Borehole/Pit No.	TP-T008
Project No.	2021CE103R	Client	Irish Drilling	Sample No.	1
				Depth Top	0.50 m
Soil Description	Brown silty clayey very sandy GRAVEL with occasional fine rootlets (gravel is fmc slate fragments)			Depth Base	1.00 m
				Sample Type	B
				Samples received	21/03/2022
				Schedules received	10/03/2022
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	22/03/2022
These results only apply to the items tested				Date tested	12/04/2022



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	94		
37.5	92		
28	89		
20	83		
14	76		
10	71		
6.3	62		
5	60		
3.35	56		
2	52		
1.18	47		
0.6	41		
0.425	38		
0.3	34		
0.212	30		
0.15	28		
0.063	26		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	48.1
Sand	26.2
Fines <0.063mm	25.8

Grading Analysis		
D100	mm	
D60	mm	5.18
D30	mm	0.207
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

K4 Soils Laboratory

Unit 8, Olds Close, Watford, Herts, WD18 9RU
Email: james@k4soils.com
Tel: 01923 711288

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Checked and Approved

Initials: J.P

Date: 13/04/2022

MSF-5-R3

Sulphate Content (Gravimetric Method) for 2:1 Soil: Water Extract and pH Value - Summary of Results
Tested in accordance with BS1377 : Part 3 : 2018, Clause 7.6 & Clause 12

Job No.	Project Name	Programme	
31592	Fahey Beg Wind Farm	Samples received	21/03/2022
		Schedule received	10/03/2022
Project No.	Client	Project started	22/03/2022
2021CE103R	Irish Drilling	Testing Started	11/04/2022

Hole No.	Sample Ref	Top m	Base m	Type	Soil description	Dry Mass passing 2mm %	SO4 Content mg/l	pH	Remarks
TP-T002	1	0.60	1.00	B	Brown silty clayey very sandy GRAVEL with traces of fine rootlets (gravel is fmc slate fragments)	55	320	7.85	
TP-T006	1	1.20	1.80	B	Brown slightly sandy gravelly silty CLAY (gravel is fmc and angular to sub-angular)	56	210	7.82	
TP-T007	1	1.00	1.50	B	Brown mottled grey silty clayey very sandy GRAVEL (gravel is fmc slate fragments)	64	270	7.83	

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

These results only apply to the items tested

Checked and Approved

Initials J.P

Date: 13/04/2022

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R29

Appendix 02a
Laboratory Test Results (Phase 2)

Project ID	2021CE102		Client	RWE	Remarks
Project Name	Fahey Beg Wind Farm		Due Date	24/05/2022 11:12	
Schedule ID	2021CE102_2		Scheduled Date	24/05/2022 11:12	

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	Water soluble sulphate content of soil sample (2:1 water / soil extract)	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	
TP-001	1.00	1.30	B	1	13/05/22		1				1	1			1			1																					ALS 220706-92
TP-001	2.00	2.30	B	2	13/05/22																																		
TP-002	1.00	1.30	B	1	13/05/22																																		
TP-002	2.00	2.30	B	2	13/05/22		1	1					1					1																					ALS 220706-92
TP-002	3.00	3.30	B	3	13/05/22																																		
TP-003	1.00	1.20	B	1	13/05/22																																		
TP-003	2.00	2.20	B	2	13/05/22		1	1																															
TP-003	3.00	3.20	B	3	13/05/22																																		
TP-003	4.10	4.40	B	4	13/05/22		1	1			1	1			1			1																					ALS 220706-92
TP-004	1.00	1.30	B	1	13/05/22		1				1	1			1			1																					ALS 220706-92
TP-004	2.00	2.30	B	2	13/05/22																																		
TP-005	0.00	1.50	B	1	13/05/22						1																													
TP-005	2.00	2.30	B	2	13/05/22																																		
TP-005	3.00	3.40	B	3	13/05/22																																		

0 = test scheduled,
1 = test completed as scheduled,
0 = sample not suitable for scheduled test

Summary of Classification Test Results

Project No.: 2021CE102

Project Name: Fahey Beg 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-001	1	1.00	1.30	B		Brown sandy SILT. Sand is fine.			25.0	100					
TP-002	2	2.00	2.30	B		Brown SAND.			37.0	100					NP
TP-003	2	2.00	2.20	B		Brown SILT			44.0	100	44	26	18		MI
TP-003	4	4.10	4.40	B		Brown slightly sandy SILT. Sand is fine.			30.0	100	31	22	9		CL
TP-004	1	1.00	1.30	B		Brown very silty fine and medium SAND.			17.0	98					
TP-005	1	0.00	1.50	B		Brown slightly sandy SILT.			47.0	99					

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: 07/12/2022 00:00

QC From No: R1

Approved By:

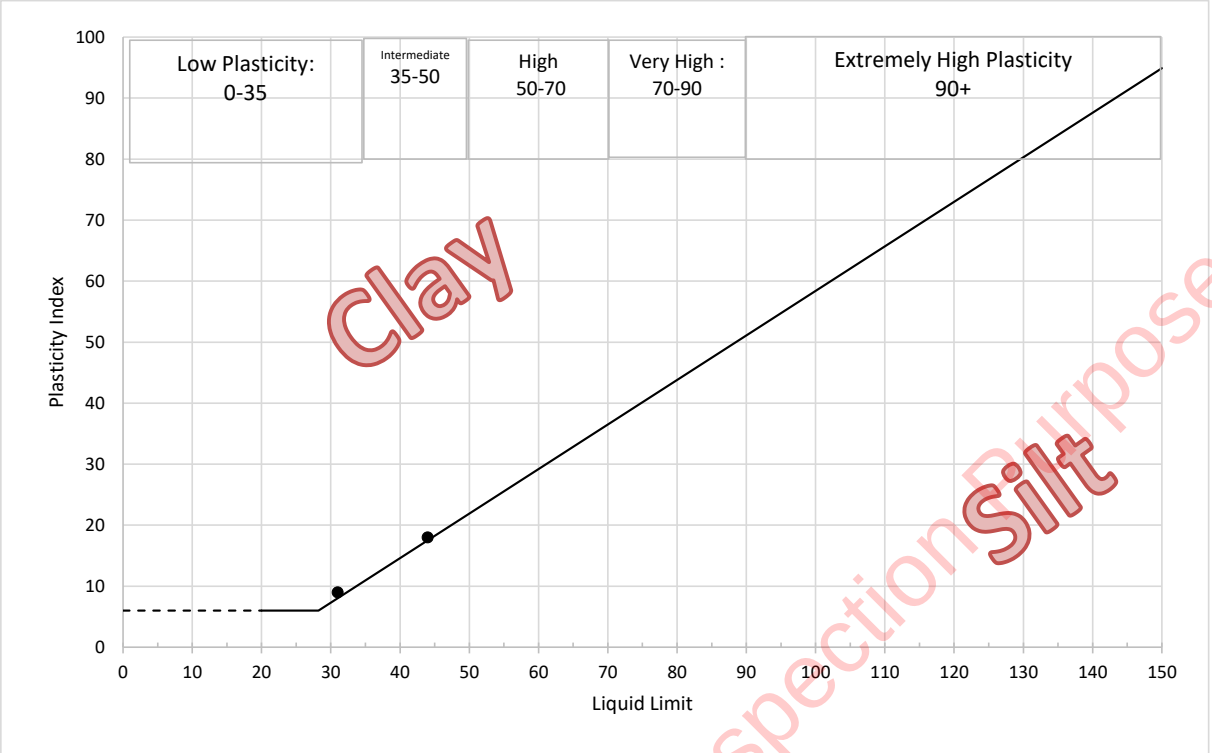
Table 1

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:	**Fahey Beg Wind Farm**	
Location:		2021CE102



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

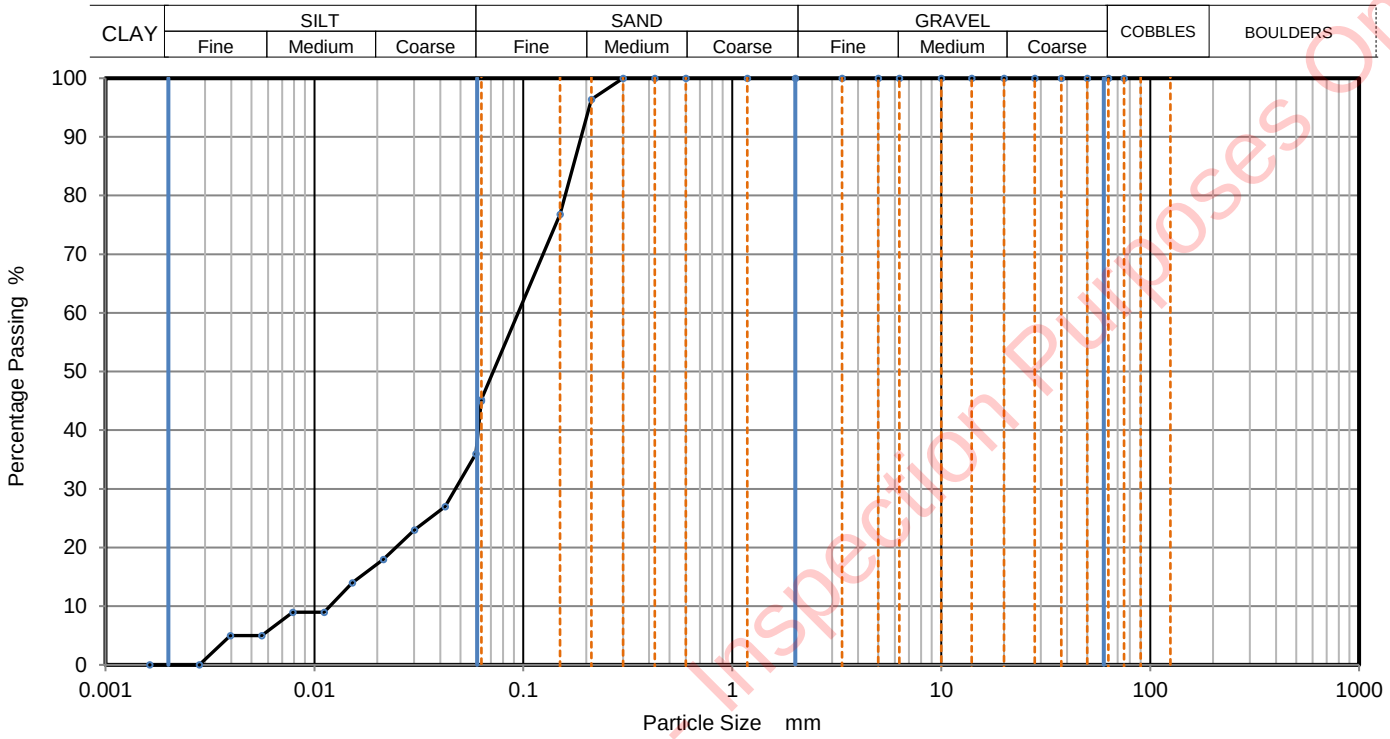
Plasticity abeviations: L = Low, I = Intermediate = H = High, V = Very High, E = Extremely High.

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	**2021CE102**
				Borehole/Pit No.	TP-001
Site Name	Fahey Beg Wind Farm			Sample No.	1
Soil Description	Brown sandy SILT. Sand is fine.			Depth, m	1.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	IDL12022052432



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	45
		0.0592	36
75	100	0.0423	27
63	100	0.0301	23
50	100	0.0214	18
37.5	100	0.0152	14
28	100	0.0111	9
20	100	0.0079	9
14	100	0.0056	5
10	100	0.0040	5
6.3	100	0.0028	0
5	100	0.0016	0
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.65	Mg/m3
0.3	100		
0.212	96		
0.15	77		
0.063	45		

Dry Mass of sample, g	266

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	55
Silt	45
Clay	0

Grading Analysis		
D100	mm	
D60	mm	0.0947
D30	mm	0.0471
D10	mm	0.0119
Uniformity Coefficient		8
Curvature Coefficient		2

Remarks

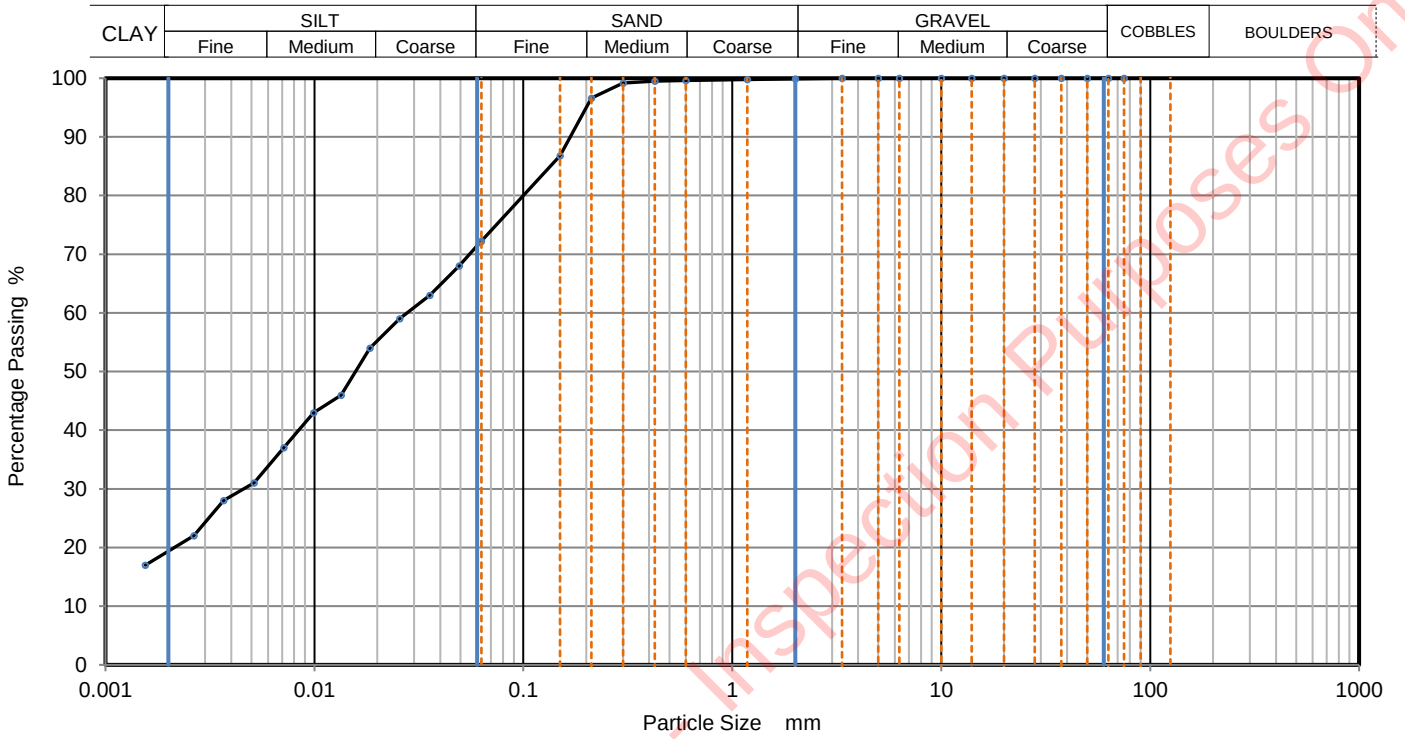
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	12/07/2022 11:22	**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	**2021CE102**
		Borehole/Pit No.	TP-003
Site Name	Fahey Beg Wind Farm	Sample No.	4
Soil Description	Brown slightly sandy SILT. Sand is fine.	Depth, m	4.10
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	KeyLAB ID	IDL12022052440



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0621	72
		0.0493	68
75	100	0.0356	63
63	100	0.0256	59
50	100	0.0185	54
37.5	100	0.0134	46
28	100	0.0099	43
20	100	0.0071	37
14	100	0.0051	31
10	100	0.0037	28
6.3	100	0.0026	22
5	100	0.0016	17
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	100	2.65 Mg/m3	
0.3	99		
0.212	97		
0.15	87		
0.063	72		

Dry Mass of sample, g	325

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	28
Silt	53
Clay	19

Grading Analysis		
D100	mm	
D60	mm	0.0274
D30	mm	0.0045
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

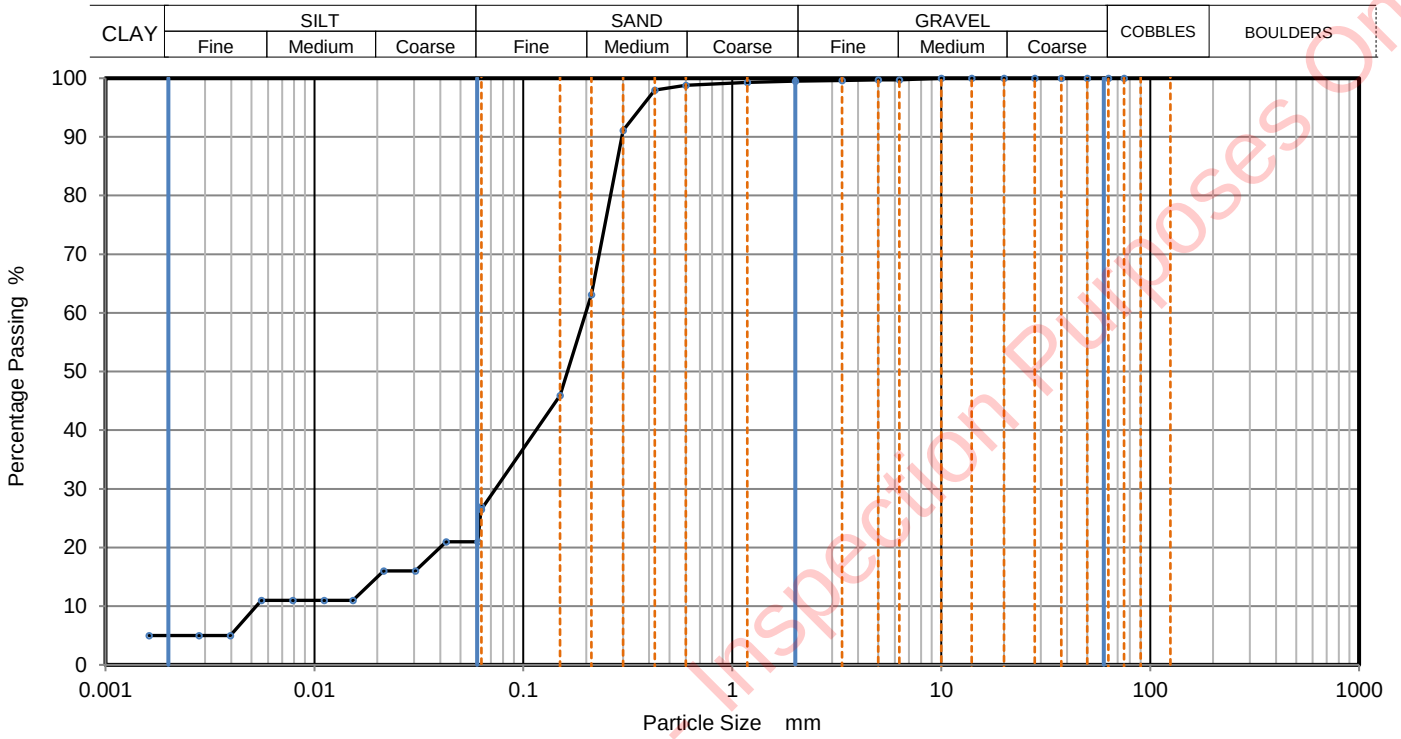
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	12/07/2022 11:22	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	**2021CE102**
		Borehole/Pit No.	TP-004
Site Name	Fahey Beg Wind Farm	Sample No.	1
Soil Description	Brown very silty fine and medium SAND.	Depth, m	1.00
Specimen Reference	Specimen Depth: m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	KeyLAB ID	IDL12022052441



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
		0.0630	27
		0.0604	21
75	100	0.0427	21
63	100	0.0304	16
50	100	0.0215	16
37.5	100	0.0153	11
28	100	0.0111	11
20	100	0.0079	11
14	100	0.0056	11
10	100	0.0040	5
6.3	100	0.0028	5
5	100	0.0016	5
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density (assumed)	
0.425	98	2.65 Mg/m3	
0.3	91		
0.212	63		
0.15	46		
0.063	27		

Dry Mass of sample, g	363

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	73
Silt	21
Clay	5

Grading Analysis		
D100	mm	
D60	mm	0.199
D30	mm	0.0736
D10	mm	0.00536
Uniformity Coefficient		37
Curvature Coefficient		5.1

Remarks

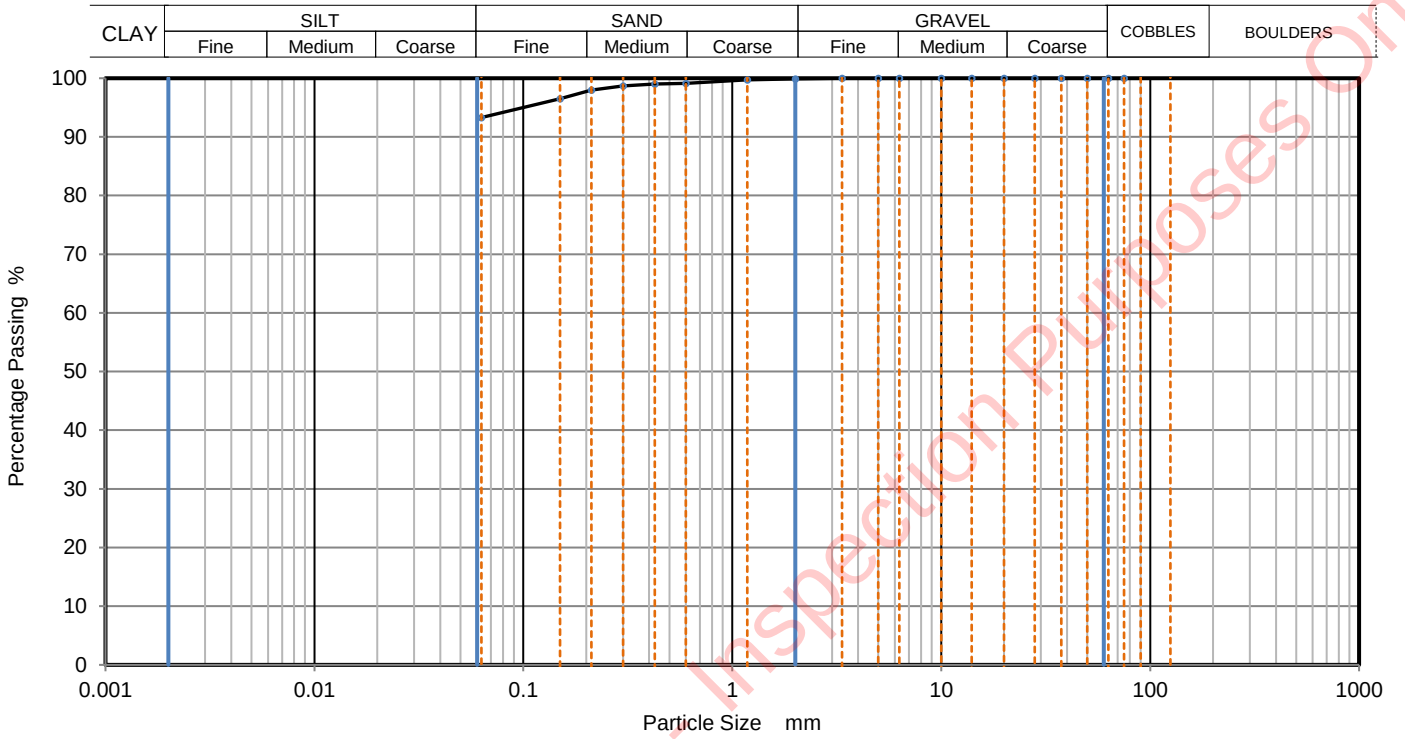
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	12/07/2022 11:22	**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	**2021CE102**
				Borehole/Pit No.	TP-005
Site Name	Fahey Beg Wind Farm			Sample No.	1
Soil Description	Brown slightly sandy SILT.			Depth, m	0.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12022052443



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	100		
1.18	100		
0.6	99		
0.425	99		
0.3	99		
0.212	98		
0.15	97		
0.063	93		

Dry Mass of sample, g	387

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	7
Fines <0.063mm	93

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.	12/07/2022 11:22	**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.

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528777
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:	13 July 2022
Customer:	Irish Drilling Limited
Sample Delivery Group (SDG):	220706-92
Your Reference:	2021CE102
Location:	Faheybeg WF
Report No:	654229
Order Number:	11407

We received 4 samples on Wednesday July 06, 2022 and 4 of these samples were scheduled for analysis which was completed on Wednesday July 13, 2022. 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.

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

1291

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
26546501	TP001	B1	1.00 - 1.30	13/05/2022
26546507	TP002	B2	2.00 - 2.30	13/05/2022
26546511	TP003	B4	4.10 - 4.40	13/05/2022
26546514	TP004	B1	1.00 - 1.30	13/05/2022

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

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
			26546501	TP001	B1	1.00 - 1.30	250g Amber Jar (ALE210)	S
			26546507	TP002	B2	2.00 - 2.30	250g Amber Jar (ALE210)	S
			26546511	TP003	B4	4.10 - 4.40	250g Amber Jar (ALE210)	S
			26546514	TP004	B1	1.00 - 1.30	250g Amber Jar (ALE210)	S
Anions by Kone (soil)	All	NDPs: 0 Tests: 4	X	X	X	X		
pH	All	NDPs: 0 Tests: 4	X	X	X	X		
Sample description	All	NDPs: 0 Tests: 4	X	X	X	X		
Total Organic Carbon	All	NDPs: 0 Tests: 1		X				

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
26546501	TP001	1.00 - 1.30	Light Brown	Loamy Sand	Vegetation	None
26546507	TP002	2.00 - 2.30	Light Brown	Silty Clay	None	None
26546511	TP003	4.10 - 4.40	Light Brown	Silt Loam	None	None
26546514	TP004	1.00 - 1.30	Light Brown	Sand	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.

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

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.	TP001	TP002	TP003	TP004		
			Depth (m)	1.00 - 1.30	2.00 - 2.30	4.10 - 4.40	1.00 - 1.30		
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)		
			Date Sampled	13/05/2022	13/05/2022	13/05/2022	13/05/2022		
			Sample Time	-	-	-	-		
			Date Received	06/07/2022	06/07/2022	06/07/2022	06/07/2022		
			SDG Ref	220706-92	220706-92	220706-92	220706-92		
			Lab Sample No.(s)	26546501	26546507	26546511	26546514		
			AGS Reference	B1	B2	B4	B1		
Moisture Content Ratio (% of as received sample)	%	PM024		19	22	23	15		
Soil Organic Matter (SOM)	<0.35 %	TM132			0.795 @ #				
pH	1 pH Units	TM133		8.65 @ M	7.76 @ M	8.41 @ M	8.3 @ M		
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.01 @ M	0.0279 @ M	0.0141 @ M	0.0069 @ 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
TM243		Mixed Anions In Soils By Kone

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM).

CERTIFICATE OF ANALYSIS

SDG: 220706-92 **Report Number:** 654229 **Superseded Report:**
Client Ref.: 2021CE102 **Location:** Faheybeg WF

Test Completion Dates

Lab Sample No(s)	26546501	26546507	26546511	26546514
Customer Sample Ref.	TP001	TP002	TP003	TP004
AGS Ref.	B1	B2	B4	B1
Depth	1.00 - 1.30	2.00 - 2.30	4.10 - 4.40	1.00 - 1.30
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	13-Jul-2022	12-Jul-2022	13-Jul-2022	13-Jul-2022
pH	11-Jul-2022	11-Jul-2022	08-Jul-2022	11-Jul-2022
Sample description	07-Jul-2022	07-Jul-2022	07-Jul-2022	07-Jul-2022
Total Organic Carbon		13-Jul-2022		

SDG:	220706-92	**Report Number:**	654229	**Superseded Report:**	
Client Ref:	2021CE102	**Location:**	Faheybeg WF		

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. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

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 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **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.

19. **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**

20. **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 (2021), 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 and soils are obtained from supplied bulk materials andd soils 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 (2021).

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.

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.

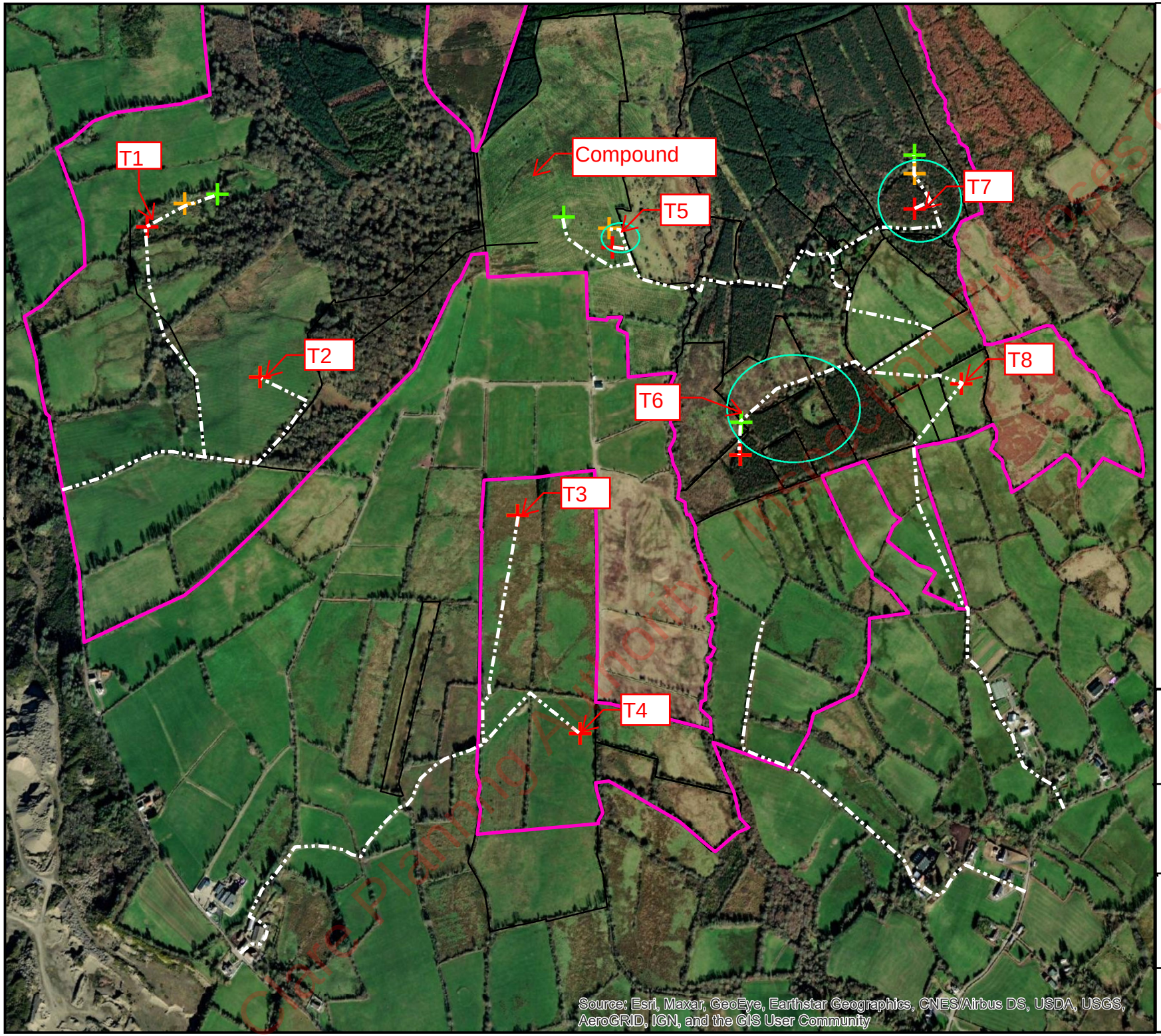
Respirable Fibres

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.

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 03
Site Plan



Project Area

Digger Access

Felliong required

N
W E
S

0 250 500 m

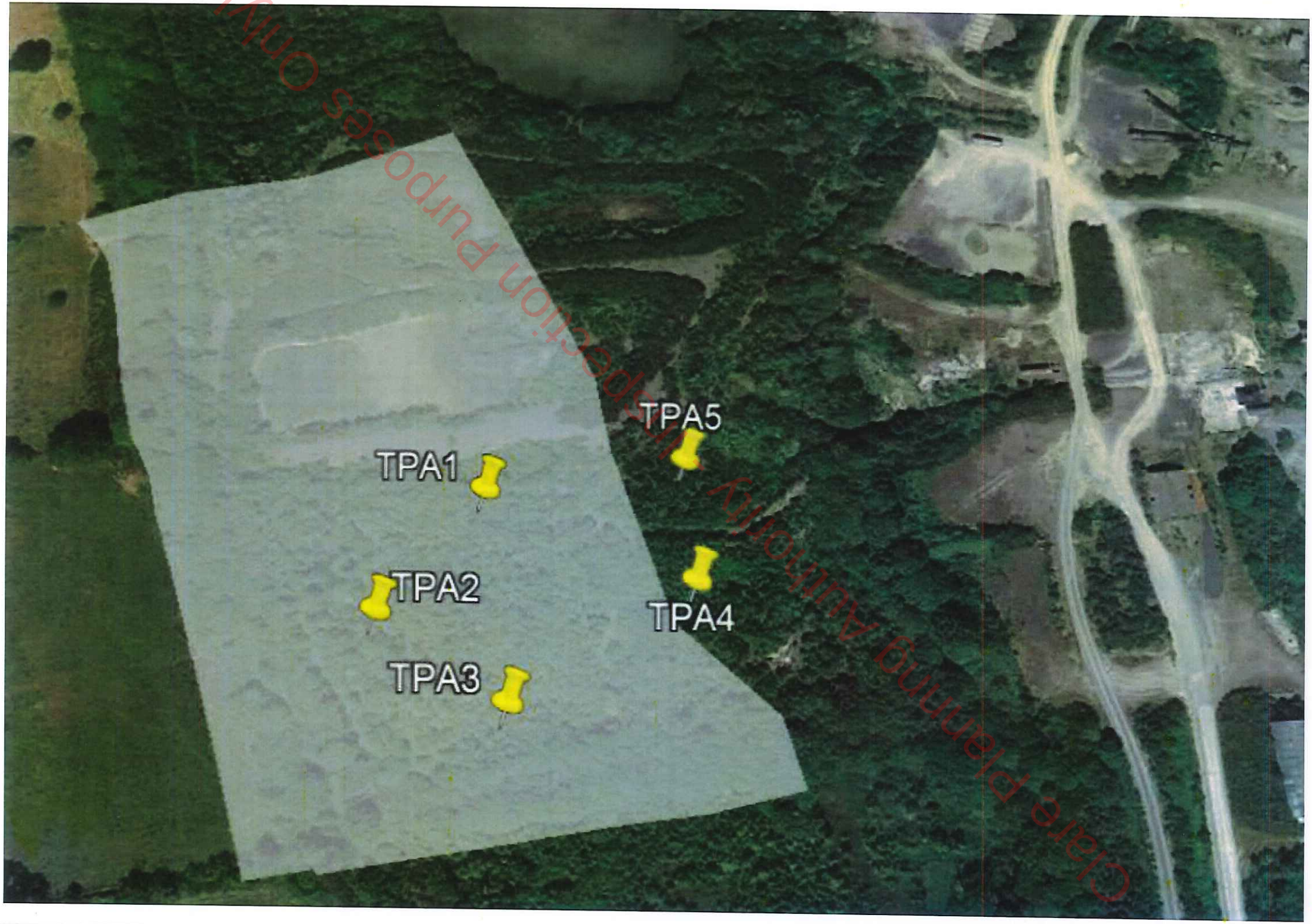
Map Title:

Fahybeg
SI Access 7Ton

Map Scales:

1:10,000 @ DIN A3

RWE



Appendix 04
Trial Pit Photographs (Phase 2)

Figure 1 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-1 (1).JPG

Figure 2 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-1 (2).JPG

Figure 3 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-2 (1).JPG

Figure 4 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-2 (2).JPG

Figure 5 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-3 (1).JPG

Figure 6 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-3 (2).JPG

Figure 7 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-4 (1).JPG

Figure 10 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-5 (2).JPG

Figure 8 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-4 (2).JPG

Figure 9 H:\21CE102.Fahey Beg Windfarm New sub-station site\TP-5 (1).JPG

Appendix 05
AGS Data

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APPENDIX 9.3

Trial Pit Logs at Proposed Substation Locations

Trial Pit Log

			Trialpit No **TP01** Sheet 1 of 1
Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562638.00 - 668866.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2 Depth 4.50	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25	-0.25		TOPSOIL
							Light brown, slightly clayey, gravelly SAND with some cobbles and occasional boulders, sub-angular to sub-rounded.
							More cobbles and boulders (angular to sub-rounded) present with depth.
				2.30	-2.30		Brown, clayey SAND with cobbles and some boulders (angular to sub-rounded).
							More cobbles and boulders (angular to sub-rounded) present with depth.
				4.50	-4.50		End of pit at 4.50 m

Remarks: Target depth of 4.50m achieved.

Rate of water flow: Dry.

Stability: Stable

Trial Pit Log

Trialpit No **TP02**

Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562662.00 - 668807.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 4.10	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25	-0.25		TOPSOIL
				0.90	-0.90		Light brown/orange, slightly clayey SAND with some gravel (sub-angular)
				1.30	-1.30		Reddish, slightly gravelly, sandy, CLAY.
				3.00	-3.00		Brown, very gravelly SAND with some cobbles and occasional boulders (sub-angular to sub-rounded). *More cobbles and boulders (angular to sub-rounded) present with depth.*
				4.10	-4.10		Brown, gravelly, SAND with many cobbles and some boulders (angular to sub-rounded). End of pit at 4.10 m

Remarks: Terminated at 4.10m depth due to refusal - possible boulders or bedrock.
Rate of water flow: Dry.

Stability: Stable

Trial Pit Log

Trialpit No **TP03** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562702.00 - 668850.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 3.50	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	-0.30		TOPSOIL
				0.90	-0.90		Light brown/orange, slightly gravelly, SAND.
				2.80	-2.80		Brown, slightly gravelly, SAND with some cobbles (sub-rounded to sub-angular)
				3.30	-3.30		Brown, SAND with many cobbles and boulders (sub-rounded to sub-angular)
				3.50	-3.50		Cobbles and Boulders (sub-angular) End of pit at 3.50 m

Remarks: Terminated at 3.50m depth due to refusal - possible boulders or bedrock.
Rate of water flow: Dry.

Stability: Stable

Trial Pit Log

Trialpit No **TP04** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562678.00 - 668897.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2 Depth 3.80	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40	-0.40		TOPSOIL
				2.30	-2.30		Brown, slightly gravelly, SAND with occasional cobbles (sub-angular to sub-rounded).
				3.80	-3.80		Brown, gravelly, SAND with cobbles and some boulders (angular to sub-rounded). *More cobbles and boulders (angular to sub-rounded) present with depth.* End of pit at 3.80 m

Remarks: Terminated at 3.80m depth due to refusal - possible boulders or bedrock.
Rate of water flow: Dry.

Stability: Stable.

Trial Pit Log

Trialpit No **TP05** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562614.00 - 668930.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 4.10	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	-0.30		TOPSOIL
				0.80	-0.80		Light brown/orange, slightly clayey, slightly gravelly, SAND.
				3.00	-3.00		Light brown, very gravelly , SAND with cobbles and some boulders (sub-rounded). *Gravel, cobbles and boulders (sub-angular to sub-rounded) present with depth.*
				4.10	-4.10		Brown, slightly gravelly SAND, with many cobbles and boulders (sub-angular to sub-rounded). Boulder seems to be SILTSTONE with iron staining. End of pit at 4.10 m

Remarks: Terminated at 4.10m depth due to instability of side wall.
Rate of water flow: Dry.

Stability: Instability of side wall.

Trial Pit Log

Trialpit No **TP06** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562336.00 - 669770.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 4.50	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Light brown, slightly gravelly, SAND.
							Cobbles and some boulders (sub-angular to sub-rounded) present with depth.
				3.60	-3.60		Brown, slight gravelly, SAND, with cobbles and some boulders (sub-angular to sub-rounded)
				4.50	-4.50		End of pit at 4.50 m

Remarks: Target depth of 4.50m achieved.
Rate of water flow: Dry

Stability: Stable.

Trial Pit Log

Trialpit No **TP07** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562294.00 - 669756.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 4.00	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND (Mixture of sand/capping/boulders/ gravel)
				0.60	-0.60		Light grey, slightly gravelly, SAND with occasional cobbles and boulders (sub-rounded to sub-angular).
				2.70	-2.70		Brown, slightly gravelly, SAND with cobbles and some boulders (sub-angular to sub-rounded). *Sand content reducing, with cobbles and boulders (sub-angular) becoming more frequent with depth from 3.30m.*
				4.00	-4.00		End of pit at 4.00 m

Remarks: Terminated at 4.00m depth due to refusal - possible boulders or bedrock.
Rate of water flow: Dry.

Stability: Stable.

Trial Pit Log

Trialpit No **TP08** Sheet 1 of 1

Project Name: Fahy Beg Wind Farm , Co. Clare	Project No. P20-003	Co-ords: 562303.00 - 669680.00 Level: 0.00	Date 05/07/2022
Location: Co. Clare		Dimensions (m): 3.6 × 1.2, Depth 3.90	Scale 1:25
Client: RWE Renewables Ireland Ltd.			Logged AW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25	-0.25		TOPSOIL
				0.60	-0.60		Brown, very sandy, GRAVEL.
				3.10	-3.10		Brown, slightly gravelly SAND with occasional cobbles (sub-angular to sub-rounded).
▼				3.90	-3.90		Brown, slight gravelly SAND with some cobbles and occasional boulders (sub-angular to sub-rounded). Probable Sandstone bedrock. End of pit at 3.90 m

Remarks: Terminated at 3.90m depth due to instability of side wall.
Rate of water flow: Trickle at base.

Stability: Instability of side wall.

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