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Kellystown Wind Farm, Drogheda, Co. Louth, Ireland

Preliminary Ground Investigation

Report No: 2200-23B Rev01

4th April 2024

*This document has been prepared by Whiteford Geoservices Ltd
on behalf of*

EDF Renewables Ltd



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Kellystown Wind Farm, Co. Louth

[SOILS AND GEOLOGY STUDY – PRELIMINARY GROUND INVESTIGATION]

Document Control

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CONTENTS

1	INTRODUCTION	2
2	SITE AND GEOLOGY	4
	2.1 The Site	
	2.2 Published Geology	
3	FIELDWORK	8
	3.1 General	
	3.2 Exploratory Holes	
	3.3 In-situ Testing	
	3.4 Topographical Survey	
4	LABORATORY TESTING	10
	4.1 Geotechnical Testing	
5	SUMMARY OF FINDINGS	11
6	REFERENCES	13

APPENDICES

A	DRAWINGS
B	PEAT DEPTHS ENCOUNTERED AT WIND TURBINE GENERATOR BASES ENGINEERING LOGS OF TRIAL HOLES
C	SOILS LABORATORY TESTING
D	PHOTGRAPHIC RECORD

1 INTRODUCTION

This report should be read in conjunction with the Kellystown Wind Farm - Desktop Study and Walkover Survey for Preliminary Determination of Ground Conditions Report 2200-23A.

In January 2023 Whiteford Geoservices Ltd was commissioned by Jennings O'Donovan Ltd to undertake investigation works at Kellystown Wind Farm near Dunleer, County Louth, Ireland, on behalf of their client EDF Renewables Ltd.

This preliminary investigation was required to obtain information for the civil design of access tracks and other infrastructure; primarily with respect to the assessment of soils and geology in relation to an application for planning permission in respect to: -

A total of 7nr new wind turbine generators, associated infrastructure and turbine hardstands as well as new and upgraded site access tracks.

The results of this site investigation have been employed to determine the nature of and condition of the soils and geology underlying the proposed major wind farm infrastructure.

Prior to undertaking these investigation works a desktop study and walkover survey had been undertaken for the site to provide a broad understanding of the prevailing ground conditions along with a screening assessment for the hazard of peat instability. As part of the walkover survey preliminary peat / organic soil thickness was recorded and a Preliminary Plot of Peat Slide Risk Hazard compiled.

This analysis determined that peat / sensitive organic soils are either not present within the zone likely to be affected by wind farm construction works or of sufficient depth to cause peat instability.

The site investigation works, detailed within this report, consist of the following elements;

The scope of these works was as follows: -

Ref	SI Component	Remarks
A	Peat probing	In-situ assessment of peat thickness at wind turbine generators. (5nr).
b	Trial pitting to determine the underlying soil type, its thickness overlying rock and the relative competence of each stratum.	A total of 14nr Trial pit exploratory holes to assess ground conditions. Each trial pit was excavated to a maximum depth of 3.5m or refusal. These exploratory holes were undertaken at the following locations: 1. WTG01 2. WTG02 3. WTG03

		<ol style="list-style-type: none">4. WTG045. WTG056. SUBSTATION7. In the vicinity of WTG02 to gather additional information in respect to hydro-geological conditions8. At a total of 8 further locations, as part of iterative adjustment of the wind farm layout
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Table 1 – Scope of SI Works

The investigation was performed in accordance with the relevant standards (see References) and data presented within the relevant appendix to this report.

This report presents the factual records of the investigations undertaken.

2 SITE AND GEOLOGY

2.1 The Site

Kellystown Wind Farm is situated approximately 4.5km south of Dunleer, County Louth and straddle undulating agricultural grazing lands between Gallstown Quarry in the north and Piperstown Livery and Equestrian Centre to the south.

Ground surface elevations vary between approximately 91m to 126m above Ordnance Datum (Malin Head).

The land usage does not appear to vary across the number of land holdings which make up the Kellystown Wind Farm development area and consist of agricultural grazing land for cattle.

The closest active quarrying operation to the site, is Gallstown Quarry, immediately bordering the north of the site, which is operated by Kilsaran Concrete Ltd.

2.2 Published Geology

A study was made of available geological information for the area (GSI Online Database). This study indicated that the following natural geology is present across the site of Kellystown Wind Farm;

- Thickly bedded calcareous greywacke (siltstone) which outcrops within the western portion of the site
- Glacial Till (derived from Lower Palaeozoic sandstones and shales)
- Alluvium (present in river valley bottoms)
- Cutover Raised Bog (isolated discrete locations)

2.2.1 Solid Geology

According to the GSI online database, the proposed development area for Kellystown Wind Farm site is immediately underlain by the Clogherhead Formation which consists of, thickly bedded calcareous greywacke.

Also present just outside the development area, north east of the site boundary, is the Red Mans Cove Formation which consists of, red, green, black mudstone

A series of three faults bisect the proposed development area trending in an approximately north north east – south south west direction and potentially impact the subsurface rock

formation at WTG02, WTG04 and WTG05, where they have the potential to have caused highly fractured and deeply weathered bedrock and / or the channelling of groundwater flow.

Such conditions can have significance for foundation design of structures such as wind turbines and will be fully investigated prior to the construction phase.

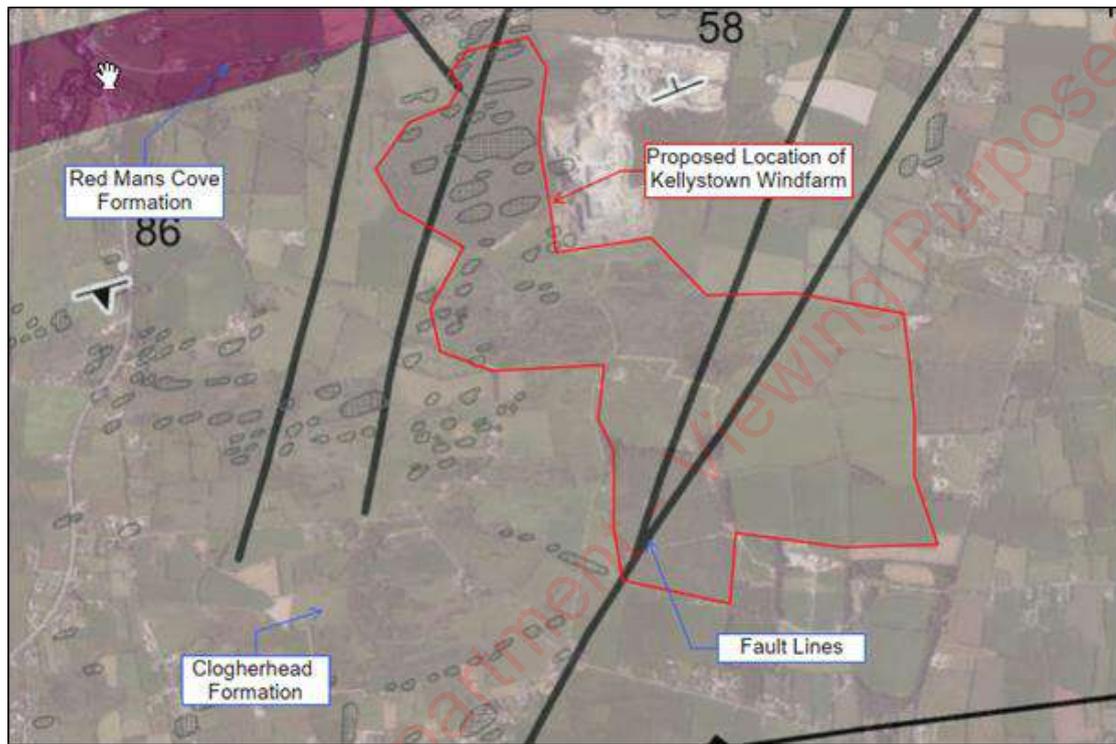


Figure 1 – Bedrock Solid Geology
Reproduced courtesy of GSI Datasets Public Viewer

Internationally, faults can often be associated with an increased hazard of ground movement. That notwithstanding, Ireland is currently located within a region of extremely low tectonic activity and well removed from regions of significant seismic activity.

The most significant event recorded in Ireland by the British Geological Survey was a low energy seismic event that occurred on 7th April 2019 more than 150km from the wind farm site. Details held for the largest and closest recorded event, within a 100km radius of the site, are contained within the table below.

yyyy-mm-dd	hh:mm:ss.ss	Lat	Lon	Depth	ML	Nsta	RMS	Intensity	Locality
27/07/1970	02:45:13.1	53.5	-5	5	2.7				ANGLESEY
16/09/1982	03:31:00.0	53.4	-5.8		0.5			2	W OF CANNICH
24/09/1982	16:28:26.1	53.31	-5.67	2.3	1.4				CELTIC SEA
16/10/1982	03:31:00.0	53.4	-5.8		0.5				KISH BASIN

24/10/1982	16:28:27.0	53.38	-5.75		1.5				KISH BASIN
11/09/1983	21:46:29.0	53.41	-6.93		0.8			3	ENFIELD
19/12/1989	21:50:07.3	53.54	-4.93	9.5	0.1				IRISH SEA
15/05/1990	20:14:11.1	53.041	-5.441	11.1	1.4	17	0.4		IRISH SEA
28/04/1992	21:34:05.6	52.931	-6.177	11	1.3	12	0.2	2	WICKLOW
10/11/2004	23:35:15.2	53.175	-5.241	7.5	2.1	17	0.3		IRISH SEA
14/12/2005	03:30:25.4	53.005	-5.644	8.8	2.8	19	0.4	3	IRISH SEA
01/12/2012	10:24:16.0	53.13	-5.253	9.6	1.1	7	0.2		IRISH SEA
21/12/2013	10:37:37.7	53.15	-5.385	12.2	1	5	0.3		IRISH SEA
07/09/2015	12:15:53.3	54.521	-5.986	3.3	0.8	3	0.4		DRUMBEG
19/09/2015	20:08:28.6	53.944	-5.037	5	0.5	8	0.4		IRISH SEA
10/03/2017	05:06:26.7	53.046	-5.509	8.9	0.7	6	0.3		IRISH SEA
18/05/2017	23:04:14.6	53.042	-5.43	13.9	0.9	8	0.3		IRISH SEA
17/11/2019	14:56:09.2	53.537	-5.441	7.5	0.7	6	0.2		IRISH SEA
15/12/2019	21:19:52.9	53.636	-4.931	7.5	2.1	21	0.4		IRISH SEA
20/12/2019	09:53:44.2	53.634	-4.932	6.5	1.1	10	0.4		IRISH SEA
13/02/2020	19:13:03.3	53.017	-5.561	10.4	1	5	0.1		IRISH SEA
06/06/2020	14:19:36.0	53.636	-4.925	5.6	1	7	0.4		IRISH SEA
17/09/2020	17:31:42.2	53.585	-6.13	17.8	1.1	10	0.2		SKERRIES
17/05/2022	23:00:56.9	53.04	-5.451	6.7	1.1	6	0.4		IRISH SEA

Table 2 – Schedule of Selected Historic Earthquakes of Significance
Reproduced courtesy of BGS Earthquake Database

	Nearest largest seismic event
	Largest recorded seismic event (within 100km)

In light of the above an assessment has been made with regard to seismic activity. This has determined that any ground movement recorded can be expected to be negligible with respect to the development proposed; where Peak Ground Accelerations can be expected to be in the order of 0.02g¹.

2.2.2 Superficial Geology

Superficial soils present within the wind farm consist of thin glacial till soils overlying shallow, often outcropping greywacke rock to the north and west. Thicker glacial tills derived from Lower Palaeozoic sandstones are present towards the south and east of the site.

¹ Source: British Geological Survey – Search of Earthquake Database centred on Kellystown Wind Farm – search radius of 100km; time period 1st Jan 1000 to 23/12/2022.

Alluvium is present throughout the Site with some isolated area of peat also indicated outside the proposed construction footprint.

For further information pertaining to site geology refer to the Desk Study and Walkover Survey Report (2200-23A).

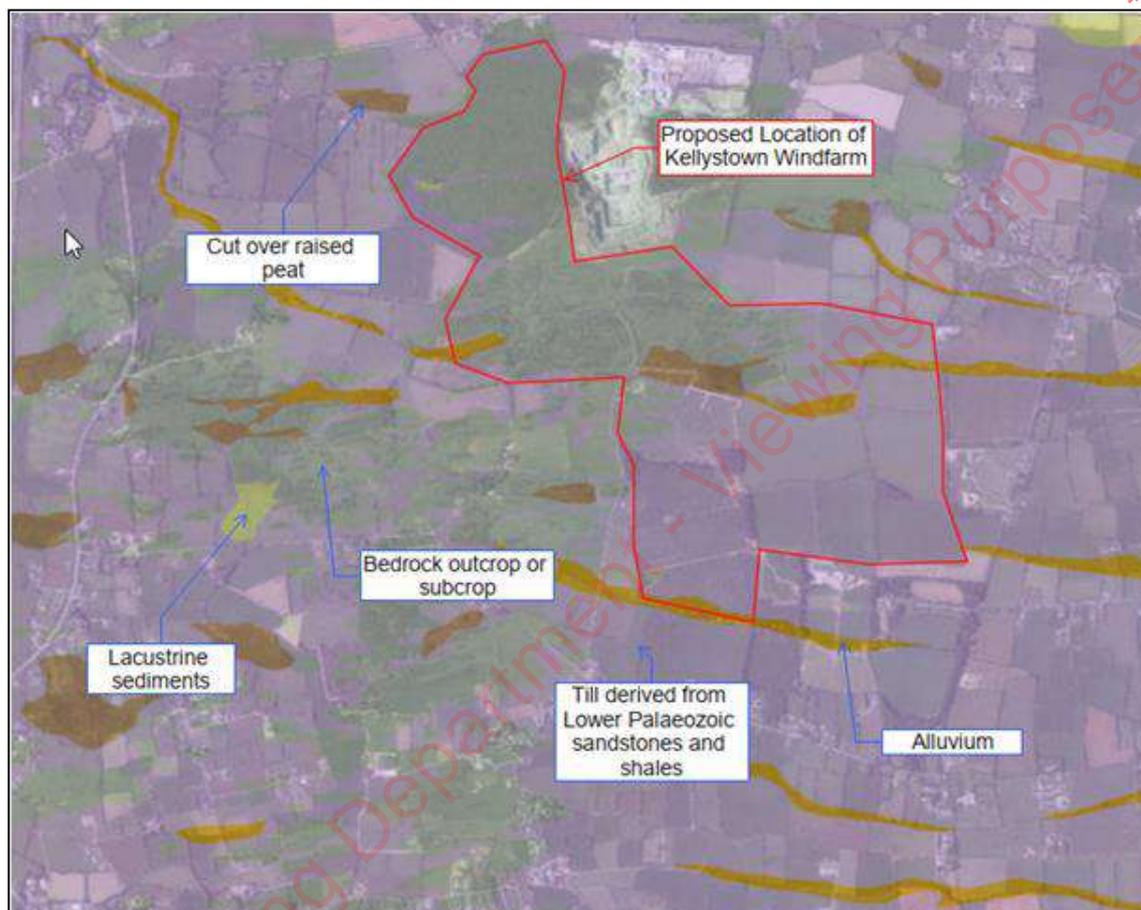


Figure 2 – Superficial Geology
Reproduced courtesy of GSI Datasets Public Viewer

3 FIELDWORK

3.1 General

All fieldwork was carried out in general accordance with BS 5930:2015+A1:2020 and other related standards.

Please refer to Appendix A for the location of all geotechnical investigations undertaken.

3.2 Exploratory Holes

The exploratory holes are detailed within the following table.

METHOD	QUANTITY	MAXIMUM DEPTH (m)	EQUIPMENT
Trial Pit	12 Nr.	3.50	Trial pits were carried out with the use of a 13T Tracked Excavator

Table 3 – Schedule of Exploratory Holes

Refer to Appendix B for engineering logs of trial holes

3.3 In-situ Testing

The in-situ testing works carried out are detailed within the following table.

TYPE	QUANTITY	MAX. DEPTH (M)	EQUIPMENT
Peat Probing	9 ²	0.00	Rigid "depthing rods"

Table 4 – Schedule of In-Situ Tests

Refer to Appendix B for details

² Peat probing was undertaken at the centre-point for each wind turbine generator. Iterative layout changes have resulted in additional observations of peat thickness at TP-A, TP-B, TP-C and TP-D. It was not possible to access the position of TP-T05 at the time, due to thick forestry. The assessment of peat thickness here was undertaken as close as possible to the proposed turbine position. Follow up, confirmatory, investigations will be undertaken following tree felling, ahead of construction.

3.4 Topographical Survey

A topographical survey of exploratory hole locations was undertaken post completion of all associated investigation works and is detailed in the table below.

EQUIPMENT	COORDINATE SYSTEM
Leica RTK / GNSS DGPS System	Irish Transverse Mercator (ITM) / Malin Hean (Ordnance Datum)

Table 5 – Topographic Surveying

4 LABORATORY TESTING

4.1 Geotechnical Testing

Following detailed analysis soils laboratory testing was undertaken on samples collected from the site.

This testing was scheduled and carried out in accordance with BS 1377 (1990) and other standards by Whiteford Geoservices Ltd.

A schedule of this testing is summarised in the table below and the results are presented within Appendix C.

TYPE	QUANTITY	REMARKS
Bulk and Dry Density	5	BS1377:1990 Part 2
Natural Moisture Content	8	BS1377:1990 Part 2
Partial size Distribution	5	BS1377:1990 Part 2
Sulphate Content of Water Extract	4	BS 1377- Part 3 (2018)
Chloride Content of Water Extract	4	BS 1377- Part 3 (2018)
Sulphide Content of Water Extract	4	BS 1377- Part 3 (2018)
pH	4	BS 1377- Part 3 (2018)
Point Load Test	5	ASTM D5731-08
Acid Test Assessment of Calcareous Rock	5	Limestone : Dolomite Field Discrimination Test, C.J. Mitchell, BGS

Table 6 – Schedule of Laboratory Test of Recovered Samples

5 SUMMARY OF FINDINGS

The following table summarises the main additional findings from the Site Investigation campaign in respect to Soils and Geology.

REF.	ITEM	DETAIL
1	Typical Soil Overburden	<p>A. Topsoil overlying thin sequence of medium dense gravelly SAND. Extremely weak rock at approx. 1.00m depth. Weak rock at < 1.50m depth. (WTG01, WTG02 & WTG03).</p> <p>B. Topsoil overlying sequence of stiff gravelly CLAY. Extremely weak rock at 2.00m to 2.80m. Weak rock at 3.00m depth (WTG04 & WTG05)</p> <p>C. Topsoil overlying sequence of stiff gravelly CLAY at 0.30m depth. (SUBSTATION).</p>
2	Typical Overburden ³ Thickness (m)	<p>WTG01 = 1.20m WTG02 = 0.70m WTG03 = 1.50m WTG04 = 3.00m WTG05 = 3.00m SUBSTATION = > 1.80m</p>
2	Rock Type	<p>Non-calcareous grey Siltstone (Greywacke) pertaining to the Clogherhead Formation.</p> <p>Shallow siltstone / greywacke strata were found to be often extremely weak and easily rippable by the excavation plant deployed for the SI campaign.</p>
4	Rock Competence	<p>Rippable⁴ siltstone, highly decomposed, is generally EXTREMELY WEAK (i.e. 0.6 – 1 MPa or VERY WEAK (i.e. 1 to 5 MPa)</p> <p>Marginally rippable, highly weathered, siltstone is generally VERY WEAK to WEAK (i.e. 1 to 5 MPa)</p> <p>WEAK to MODEARTELY WEAK Siltstone (i.e. 5 to 12.5MPa) is generally non rippable, unless close to a joint or bedding plane</p> <p>MEDIUM STRONG Siltstone (i.e. 25 - 50 MPa) is non-rippable</p>
5	Typical Depth to Non Rippable Rock ⁵	<p>WTG01 = 1.20m WTG02 = 0.70m WTG03 = 1.50m WTG04 = >3.00m WTG05 = > 3.00m SUBSTATION = > 1.80m</p>
6	Anticipated Wind Turbine Foundation Type	<p>WTG01 = Gravity Base within weathered rock WTG02 = Gravity Base within weathered rock WTG03 = Gravity Base within weathered rock WTG04 = Ground Improvement / Piled Foundation WTG05 = Gravity Base within weathered rock SUBSTATION = Raft, strip or pad foundations within the stiff glacial till soils</p>

³ Extremely weak rock is considered to be overburden, as are soils. Weak rock is not considered to be overburden and is anticipated to be the limit of straightforward conventional excavation.

⁴ Rippability is based on potential rippability by 13T machine resting on top of the rock formation.

⁵ Using 9T tracked excavator

REF.	ITEM	DETAIL
6	Groundwater Regime	Weak flow at 2.0m (WTG04 - Mobile) Seepage at 2.6m (WTG05) - Mobile No groundwater encountered at WTG01, WTG02, WTG03 and SUBSTATION
7	GSI – Crushed Rock Aggregate Potential	According to Geological Survey Ireland, the Aggregate Potential for the Borrow Pit site can be summarised as follows: - Very High – Majority of development area, including all turbine locations. High – Low lying lands between WTG02 / WTG05 and public road along eastern boundary.
8	Predicted Performance as a construction fill material	Suitable. Siltstone (Clogherhead Formation) is more suitable for use as construction fill. The extremely weak to weak shallow soils are highly weathered and although suitable as fill, its crushed aggregate may degrade rapidly to fine material where left exposed to weather and traffic. Deeper unweathered siltstone is anticipated to produce a better-quality aggregate, although calcareous content may detract from its quality.
9	Predicted Performance as a construction aggregate	Only Medium Strong SILTSTONE rock strata (or better) has potential. This material was not encountered during the SI campaign, but believed to be present at depths > 3.50m below existing ground level. This material can be expected to produce significantly less fine content than the weathered strata that has been identified in the majority of the trial holes.

Table 7 - Summary of Findings

6 REFERENCES

BS 1377: 1990 : Methods of test for soils for civil engineering purposes. British Standards Institution.

BS 5930:2015 + A1:2020 Code of practice for ground investigations. British Standards Institution.

BS EN 1997-2: 2007 : Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1: 2002 : Geotechnical investigation and testing - Identification and classification of soil - Part 1 Identification and description. British Standards Institution.

BS EN ISO 14689-1: 2003 : Geotechnical investigation and testing - Identification and classification of rock - Part 1 Identification and description. British Standards Institution.

BS EN ISO 22475-1: 2006 : Geotechnical investigation and testing – Sampling methods and groundwater measurements - Part 1 Technical principles for execution. British Standards Institution.

BS EN ISO 22476-2: 2005 : Geotechnical investigation and testing - Field testing - Part 2 Dynamic probing. British Standards Institution.

BS EN ISO 22476-3: 2005 : Geotechnical investigation and testing - Field testing - Part 3 Standard penetration test. British Standards Institution.

ISRM: 2007: The Complete ISRM Suggested Methods for Rock Characterisation, Testing and Monitoring (1974-2006). Commission on Testing Methods, International Society for Rock Mechanics (Editors Ulusay R & Hudson JA).

ASTM D5731-08: Standard test method for determination of the point load strength index of rock and application to rock strength

Limestone : Dolomite Field Discrimination Test, C.J. Mitchell, BGS, Mineralogy and Petrology Group, Report No: MSPR 95/67. 1st December 1995.

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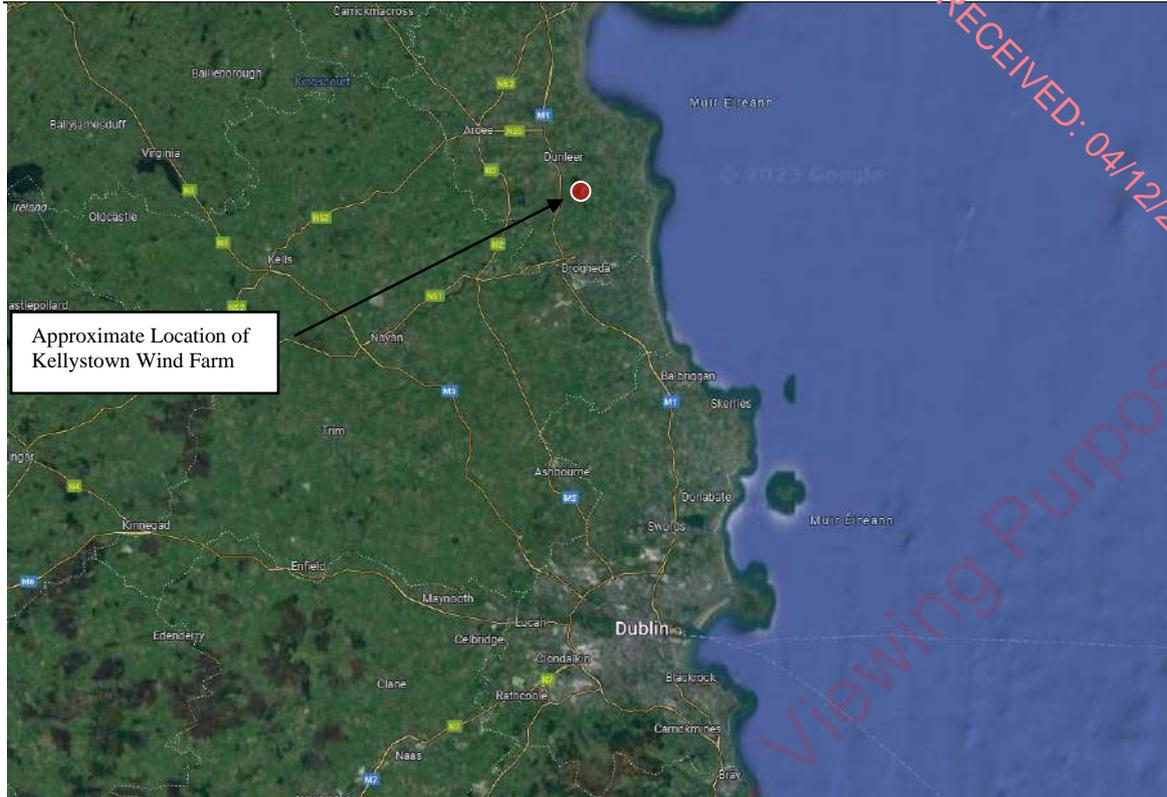
APPENDICES

Appendix A	Drawings
Appendix B	Exploratory Holes and In-situ Test Results
Appendix C	Laboratory Testing Results Employed for Analysis Purposes
Appendix D	Photographic Record

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APPENDIX A DRAWINGS

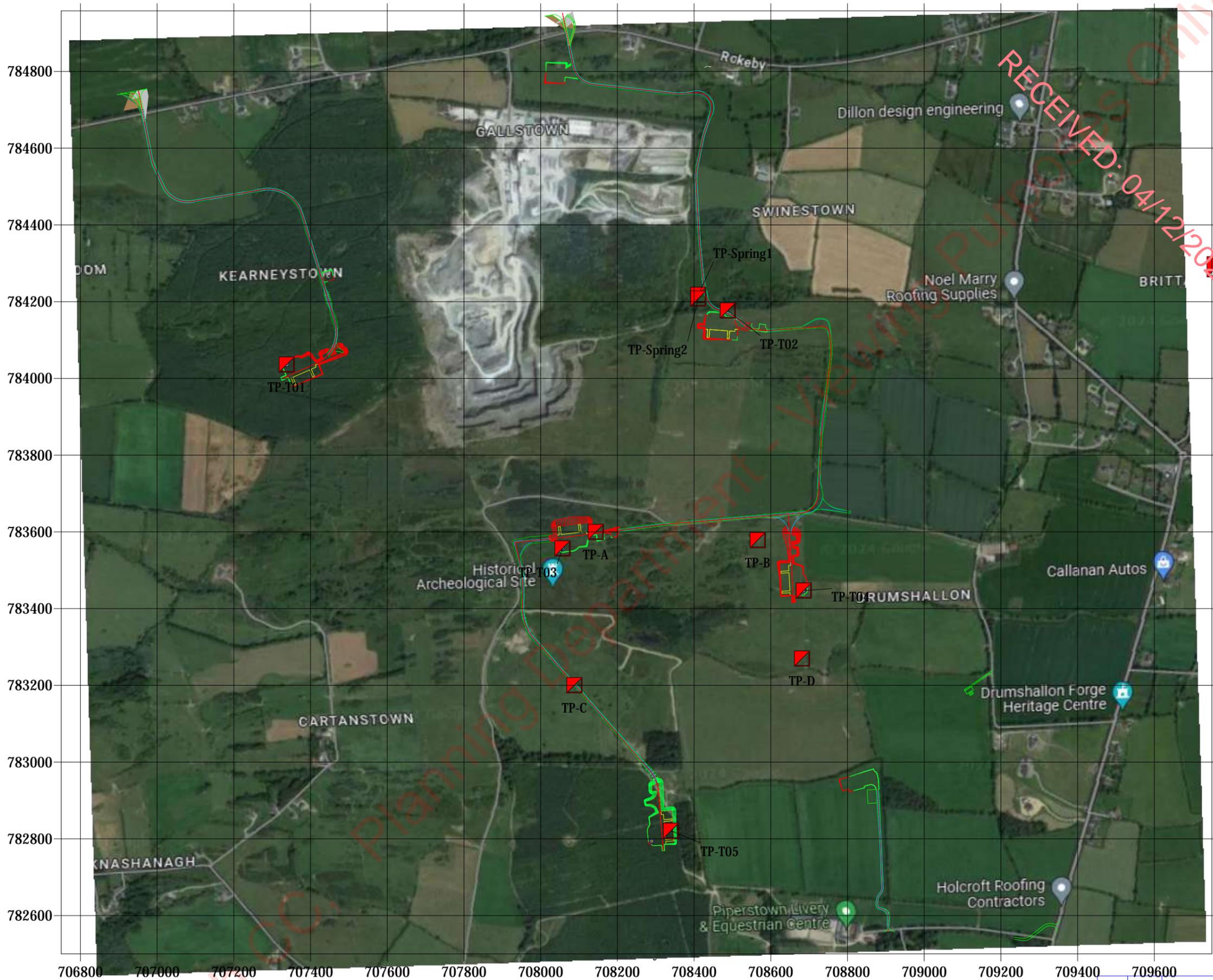
General Site Location Plan	1 x A4
Site Layout Plan showing position of Exploratory Holes and Insitu Tests (rev01) Ref: 2200/23 – L1	1 x A3
Geological Survey of Ireland Public Viewer Data – Solid and Structural Geology	1 x A4
Geological Survey of Ireland Public Viewer Data – Superficial Soils and Landforms	1 x A4
Geological Survey of Ireland Public Viewer Data – Aggregate Potential	1 x A4
Geological Survey of Ireland Public Viewer Data – Aggregate Overburden Scores	1 x A4
Geological Survey of Ireland Public Data Viewer – Aggregate Bedrock Scores	1 x A4



P1 - General Location Plan (Aerial view)
(© Google Maps 2024)



P2 - Local Location Plan (Aerial view)
(© Google Earth 2024)



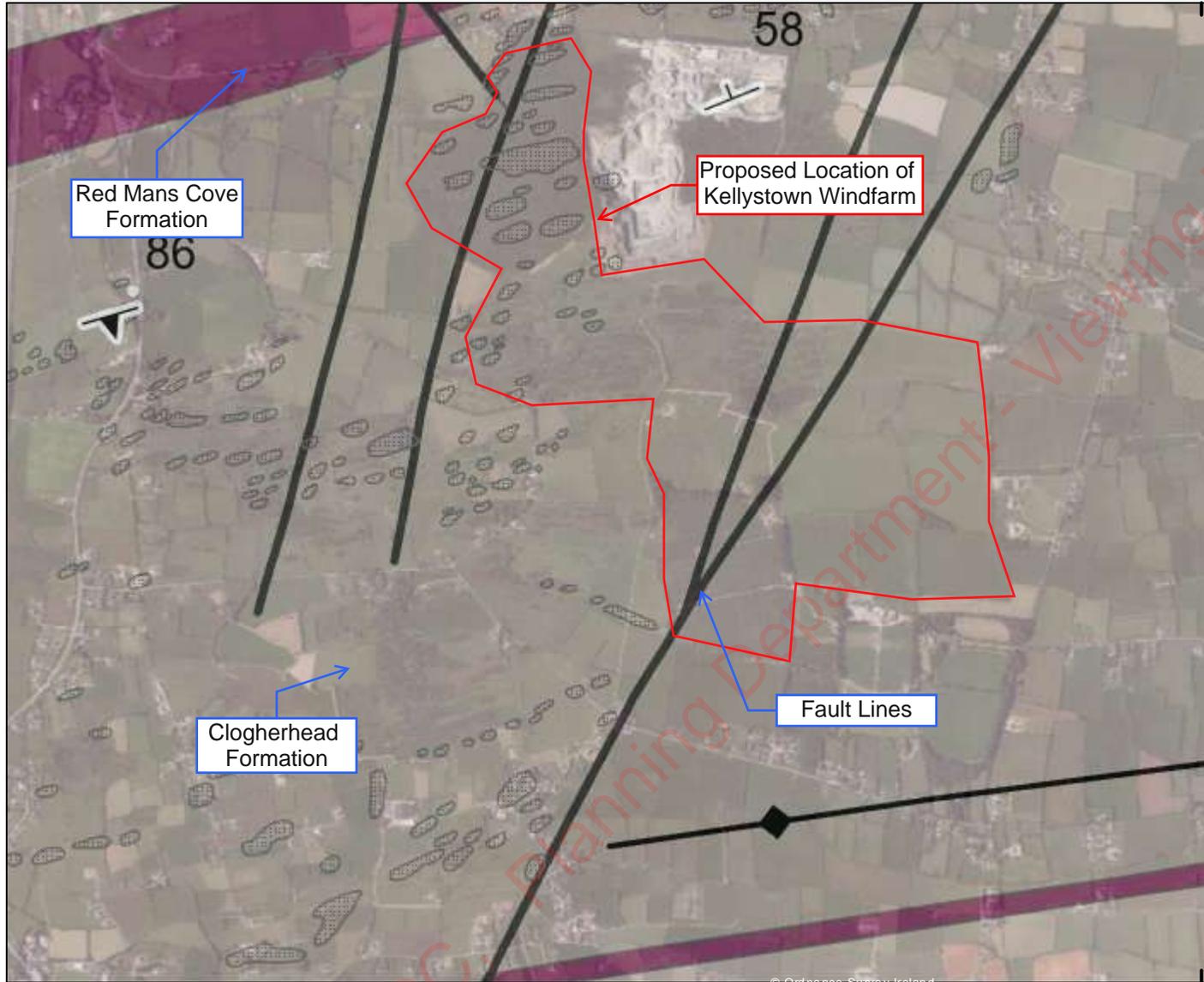
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Position of Exploratory Trial Hole

Notes:

1. All Positions are relative to ITM
2. Elevation are relative to Malin Head Datum

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Whiteford Geoservices Ltd Straid House 2 Main Street, Straid, BALLYCLARE, Co. Antrim, UK BT39 9 NE			Preliminary Ground Investigations As-built Exploratory Hole Plan Kellystown Wind Farm		
			Edition	Sheet	
			1	A3	



Legend Structural Symbols 100K ITM 2018

- ◀ GSI data
- ↗ First foliation parallel to bedding
- ↖ Foliation trend, Thorr and Rosses Granites
- ⊕ Horizontal Bedding
- ↘ Strike and dip of bedding, right way up
- ↙ Strike and dip of bedding, way up unknown
- ↗ Strike and dip of first foliation
- ↖ Strike and dip of overturned bedding
- ↘ Strike and dip of second foliation
- ↙ Strike and dip of third foliation
- ↘ Strike and plunge of first generation fold axis
- ↙ Strike and plunge of second generation fold axis
- ↘ Strike and plunge of third generation fold axis
- ⊕ Strike of vertical bedding/foliation
- ↘ Strike of vertical first foliation
- <all other values>

- Ghost Line
- Goniatite marine band (R1-R4)
- Lithological boundary offshore
- Metadolerite sheet, mainly sills
- Paleogene/ Tertiary
- Dyke
- Synclinal Axis
- Synformal axis
- Tectonic Slide, barbs on hanging-wall
- Thin stratigraphical unit, diagrammatic
- Thrust, barbs on hanging-wall side
- Tuff band
- Unconformity, dots on younger side
- X-Section

- ### Bedrock Geology
- Clogherhead Formation
 - Red Mans Cove Formation

Bedrock Outcrops 100 ITM 2018

Bedrock Linework 100k ITM 2018

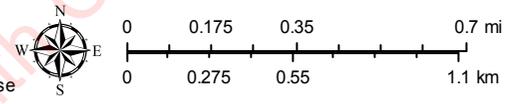
- ◆ Anticlinal Axis
- ◆ Antiformal axis
- Aquifer Boundary
- Area
- Coal seam
- Dyke
- Fault

Scale: 1:25,000

Geological Survey Ireland

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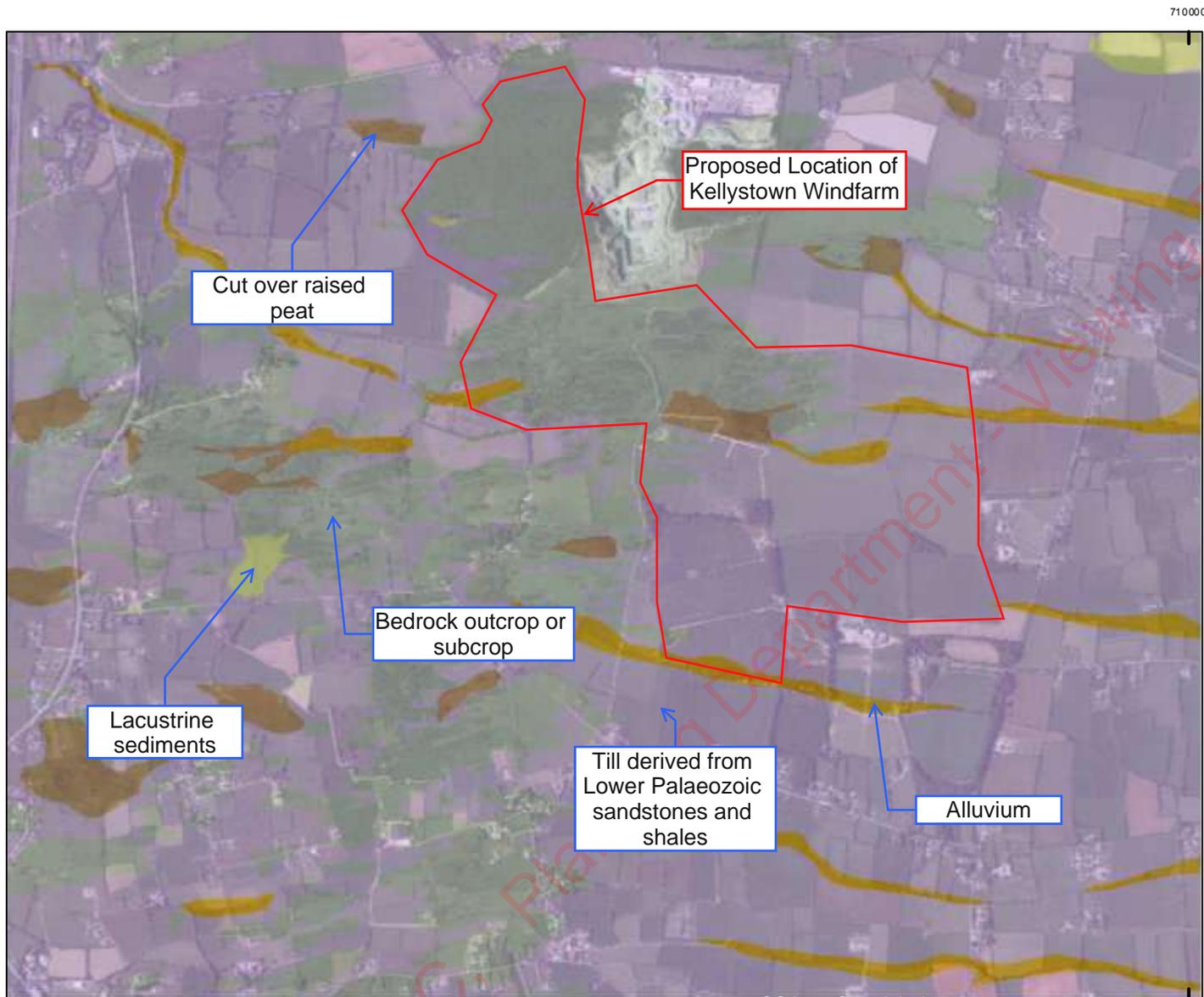


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Quaternary Sediments

- Alluvium
- Cut over raised peat
- Lacustrine sediments
- Till derived from Lower Palaeozoic sandstones and shales
- Bedrock outcrop or subcrop

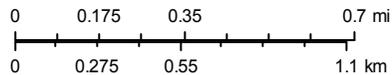


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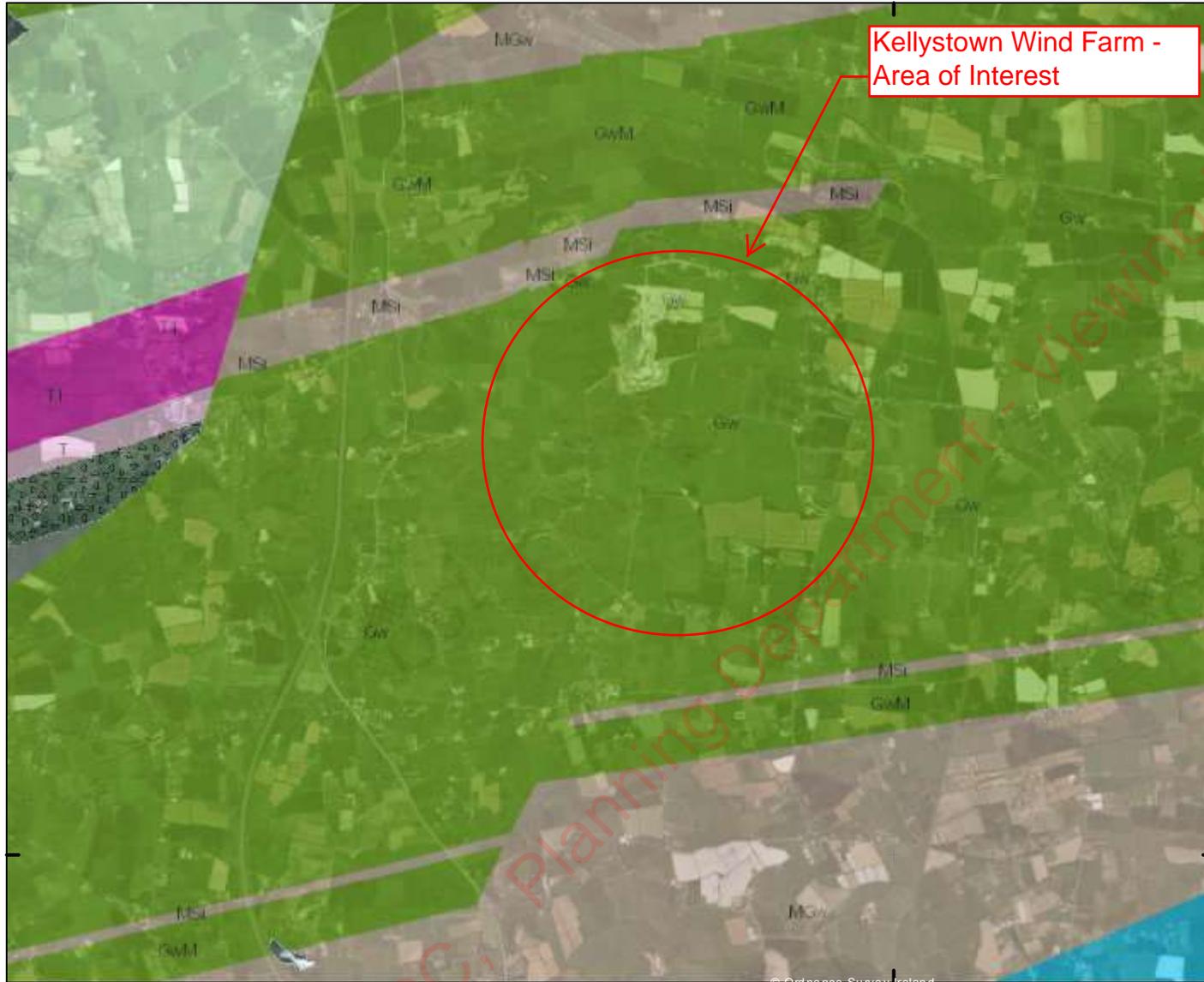
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GSI Mapping - Aggregate Bedrock Scores



Kellystown Wind Farm -
Area of Interest

Legend

Bedrock Scores

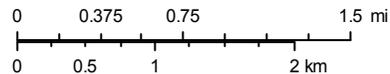
- | | | | |
|-----------|--|------|---------------------------------|
| A | Andesite | meV | Metavolcanics, basic and acidic |
| Am | Amphibolite, hornblende schist | Po | Porphyry |
| B | Basalt | Ps | Psammitic, psammitic schist |
| Br | Breccia | P/Sc | Pelite, mixed schist |
| C | Conglomerate | Q | Quartzite |
| Ch | Chert | Qz | Quartz rock, pegmatite |
| D | Dolerite | QzS | Quartzitic/siliceous sandstone |
| Di/Ga | Diorite and gabbro | S | Sandstone |
| Do | Dolomite, dolomitic limestone | Sh | Shale |
| F | Flagstone | Si | Siltstone |
| FV/IV | Felsic and intermediate volcanics, tuff | Sl | Slate; argillite, phyllite |
| G | Granite, granodiorite | SP | Semi-pelitic schist |
| Gn | Gneiss | Tu | Turbidite |
| Gt | Grit | Vc | Volcaniclastics |
| Gw | Greywacke | | |
| H | Hornfels | | |
| L | Limestone | | |
| Lbo | Bouldery limestone, limestone conglomerate | | |
| LCa | Calp limestone | | |
| LChT | Limestone and chert, tuff | | |
| Li | Lithologically diverse | | |
| Lmi | Micritic or fine limestone | | |
| LMSi | Limestone and mudstone, siltstone | | |
| Lo | Oolitic limestone | | |
| LS | Limestone and sandstone | | |
| LSH | Limestone and shale | | |
| M | Mudstone | | |
| Ma | Marble, marble-schist | | |
| sequences | | | |
| miG | Microgranite | | |

Scale: 1:54,308

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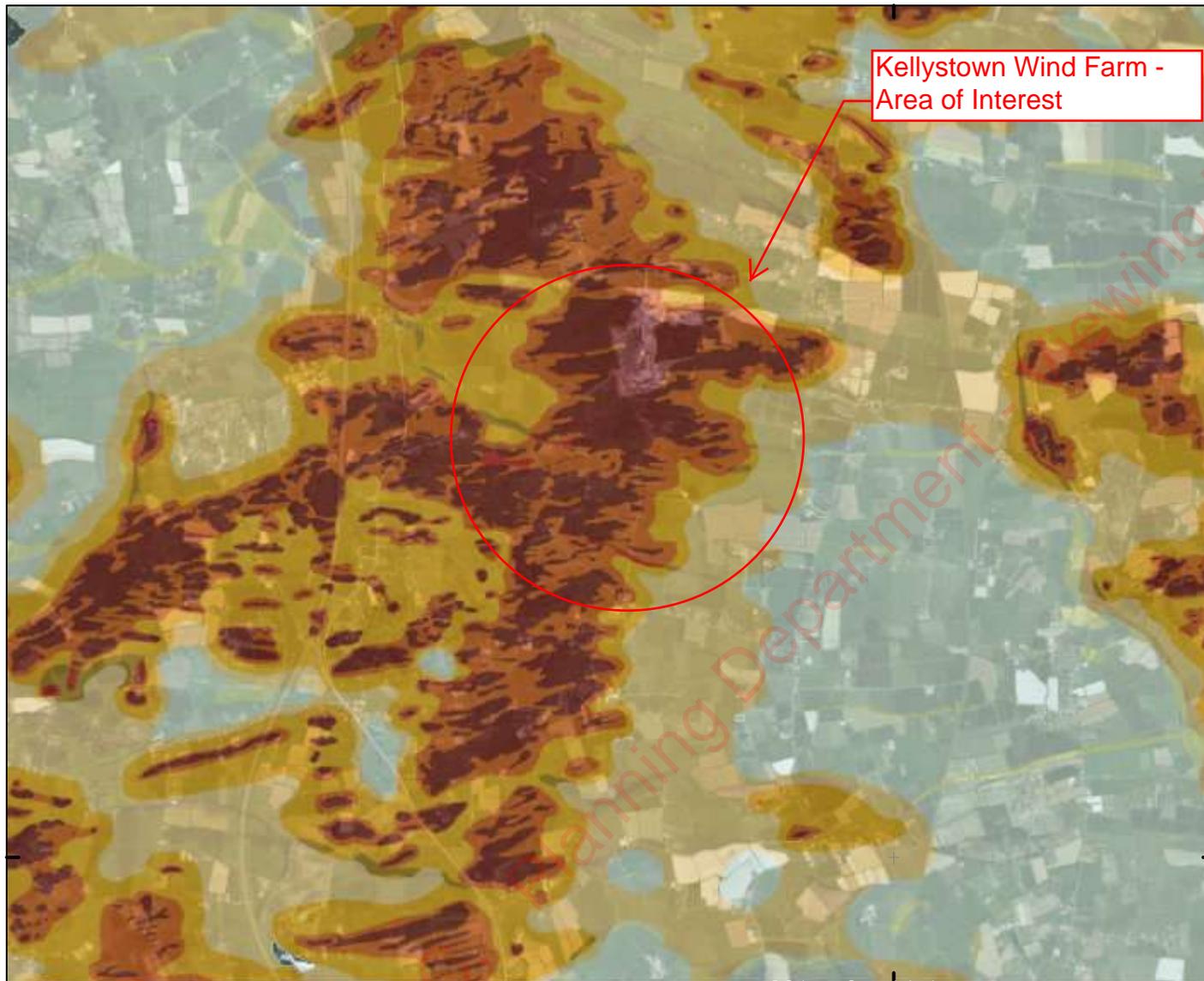
Map Centre Coordinates (ITM) 707,615 783,027
1/25/2023, 1:13:21 PM

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GSI Mapping - Aggregate Overburden Scores

Legend

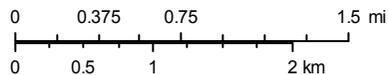
- Overburden Scores**
- 10 (minimal or no overburden)
 - 9
 - 8
 - 7
 - 6
 - 5
 - 4
 - 3
 - 2
 - 1 (thick overburden)
 - 0 (overburden)
 - inferred, below water



Scale: 1:54,308
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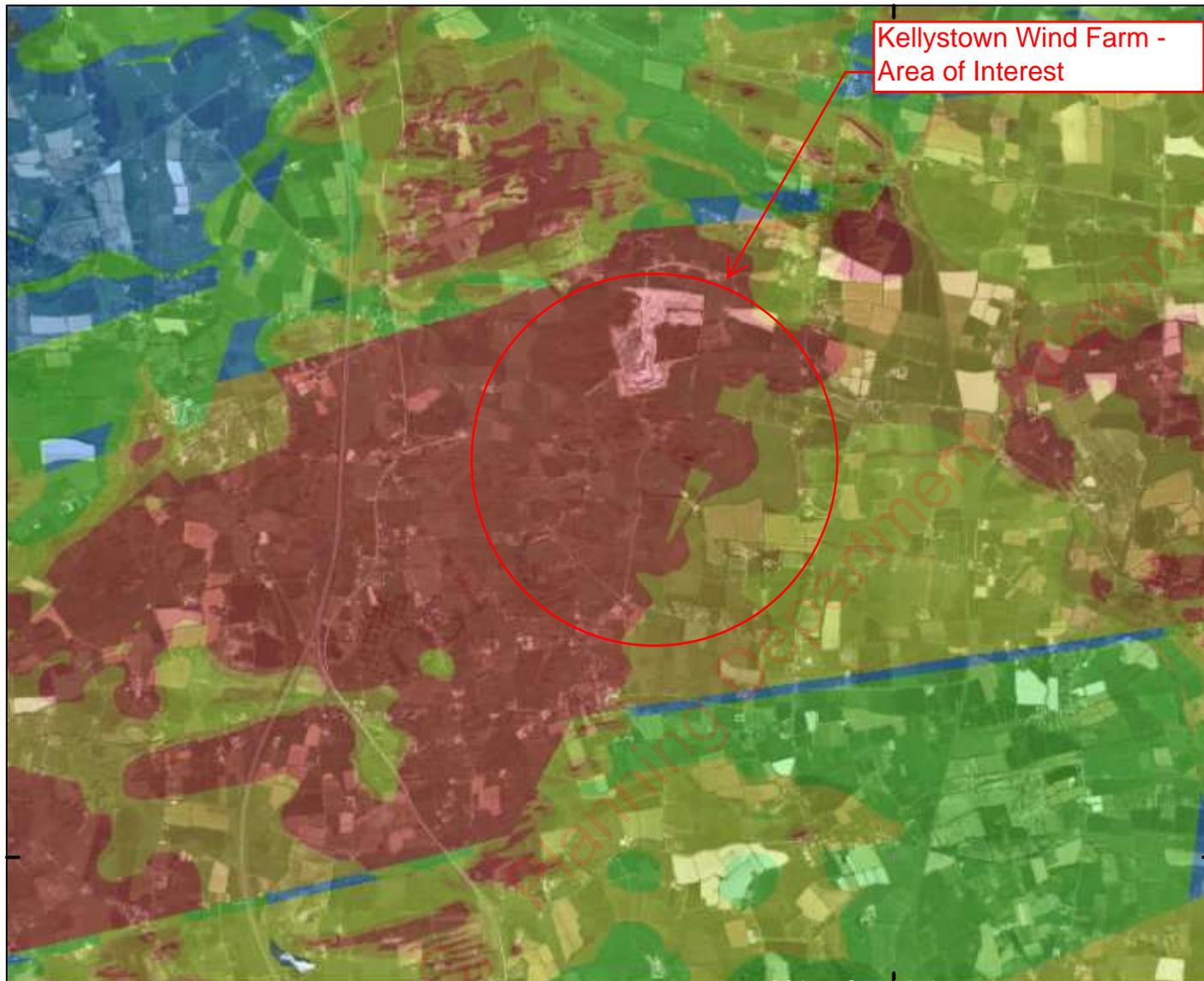
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GSI Mapping - Aggregate Potential

Legend

Crushed Rock Aggregate Potential

- Very High potential
- High potential
- Moderate potential
- Low potential
- Very Low potential

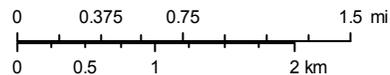


Scale: 1:54,308

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APPENDIX B

IN-SITU TEST RESULTS AND LOGS OF EXPLORATORY HOLES

Peat Thickness at Turbine Locations	1 x A4
Trial Pit Logs	12 x A4

2200-23 - Kellystown Wind Farm**Preliminary Data of Peat Depth at Turbines - Updated 08/04/2024**

Location	Easting	Northing	Thickness Peat (m)	Soil Type
T-01	707338	784036	0	TOPSOIL
T-02	708488	784177	0	TOPSOIL
T-03	708057	783557	0	TOPSOIL
T-04	708686	783447	0	TOPSOIL
T-05	708340	782821	0	TOPSOIL
TP-C	708087	783205	0	TOPSOIL
TP-D	708763	783183	0	TOPSOIL
TP-B	708560	783584	0	TOPSOIL
TP-A	707981	783632	0	TOPSOIL

Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 07/12/2022
		Contractor:	Co-ords: E708143.92 N783599.74

Location: Piperstown, Co. Louth	Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2
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Location Number TP-A	Location Type TP	Level 99.13m AoD	Logged By J.Stothers	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
Well	Water Strikes				0.50	98.63		Soft, brown, sandy TOPSOIL with medium cobble content.	
		0.75	B		1.40	97.73		Medium dense, orangish brown, clayey, gravelly, fine to coarse SAND with a medium cobble and boulder content.	1
		1.50	B		2.00	97.13		Firm to stiff, orangish brown, sandy, gravelly SILT/CLAY with a medium cobble content.	2
		2.50	B		3.50	95.63		Probable extremely weak, grey stained orangish black, destructured SILTSTONE / GREYWACKE Excavated as; Dense orangish brown, slightly clayey, sandy GRAVEL with a high cobble and medium boulder content.	3
									End of Pit at 3.500m

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides stable upon completion	None		0.00	3.50	Arisings

Remarks No groundwater encountered.	
--	--

Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 07/12/2022
		Contractor:	Co-ords: E708565.93 N783578.45

Location: Piperstown, Co. Louth	Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2
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Location Number TP-B	Location Type TP	Level 97.15m AoD	Logged By J.Stothers	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40	96.75		Soft, brown, sandy TOPSOIL with medium cobble content.	
		0.50	B					Medium dense, orangish brown, clayey, gravelly, fine to coarse SAND with a medium cobble content.	1
					1.30	95.85		Probable extremely weak, grey stained orangish black, destructured SILTSTONE / GREYWACKE	
		1.50	B					Excavated as; Dense, orangish brown, clayey, sandy, fine to coarse GRAVEL with a medium cobble and low boulder content.	2
					2.20	94.95		Probable extremely weak, grey stained orangish black, destructured SILTSTONE / GREYWACKE	
		2.50	B					Excavated as; Dense COBBLES with some orangish brown, clayey, sandy, fine to coarse GRAVEL with a medium boulder content.	3
				3.00	94.15		Probable extremely weak, grey stained orangish black, distinctly weathered SILTSTONE / GREYWACKE		
	3.20	B					Excavated as; Dense BOULDERS with some orangish brown, clayey, sandy, fine to coarse GRAVEL with a medium cobble content.	4	
				3.50	93.65		End of Pit at 3.500m		

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides stable upon completion	None		0.00	3.50	Arisings

Remarks No groundwater encountered.	
--	--

Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 08/12/2022
		Contractor:	Co-ords: E708087.97 N783200.32

Location: Piperstown, Co. Louth	Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2
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Location Number TP-C	Location Type TP	Level 100.49m AoD	Logged By J.Stothers	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
Well	Water Strikes				0.30	100.19		Soft, brown, sandy TOPSOIL with medium cobble content.
		0.50	B		0.80	99.69		Medium dense, orangish brown, clayey, gravelly, fine to coarse SAND with a medium cobble content.
		1.50	B		2.50	97.99		Probable extremely weak, grey stained orangish black, destructured SILTSTONE / GERYWACKE Excavated as; Dense, orangish brown, clayey, sandy, fine to coarse GRAVEL with a medium cobble and low boulder content.
		3.00	B		3.20	97.29		Probable extremely weak, grey stained orangish black, destructured SILTSTONE / GREYWACKE Excavated as; Dense COBBLES with some orangish brown, clayey, sandy, fine to coarse GRAVEL with a medium boulder content.
					3.50	96.99		Probable extremely weak, grey stained orangish black, distinctly weathered SILTSTONE / GREYWACKE

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides stable upon completion	None		0.00	3.50	Arisings

Remarks No groundwater encountered.	
--	--

Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 07/12/2022
		Contractor:	Co-ords: E708681.53 N783269.80

Location: Piperstown, Co. Louth	Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2
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Location Number TP-D	Location Type TP	Level 88.92m AoD	Logged By J.Stothers	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
▼					0.40	88.52		Soft, brown, sandy TOPSOIL with medium cobble content.	
	0.50	B			1.30	87.62		Firm to stiff, grey mottled orange, sandy SILT with some fine rootlets.	1
	1.50	B			1.80	87.12		Medium dense, silty, fine to coarse SAND with pockets of stiff sandy SILT and loose fine to medium GRAVEL.	
					2.00	86.92		Loose, grey, fine to medium GRAVEL	2
	2.50	B						Loose to medium dense, greyish brown, slightly silty, fine to coarse SAND	
	3.00	B			3.00	85.92		Stiff, greyish brown, sandy SILT with a medium boulder content.	3
	3.50				3.50	85.42		End of Pit at 3.500m	4

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides unstable upon completion	None		0.00	3.50	Arisings

Remarks Groundwater encountered 1.9m b.g.l (Weak flow).	
--	--

Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 06/02/2024
		Contractor:	Co-ords: E708411.00 N784218.00

Location: Piperstown, Co. Louth	Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2
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Location Number TP-SPRING1	Location Type TP	Level	Logged By J.Ardern	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	B		0.10		Soft, brown, silty, sandy TOPSOIL	
					0.40		Weak, dark grey, fine grained, distinctly weathered SILTSTONE / GREYWACKE	
							End of Pit at 0.400m	
								1
								2
								3
								4

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	1.50	Sides stable upon completion	None		0.00	0.40	Arisings

Remarks No groundwater encountered.	
--	--

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Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 06/02/2024
		Contractor:	Co-ords: E708411.00 N784208.00

Location: Piperstown, Co. Louth	Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2
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Location Number TP-SPRING2	Location Type TP	Level	Logged By J.Ardern	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
[Hatched Pattern]		0.20			0.20		Soft, brown, silty, sandy TOPSOIL	
		0.50	B			[Circular Pattern]	Stiff, greyish brown, slightly gravelly CLAY with a low cobble and boulder content	
		1.40	B		1.30 1.50	[Cross-hatch Pattern]	Extremely weak, dark grey, fine grained, distinctly weathered SILTSTONE / GREYWACKE	
							End of Pit at 1.500m	

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	1.50	Sides stable upon completion	None		0.00	1.50	Arisings

Remarks No groundwater encountered.	
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Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 05/02/2024
		Contractor:	Co-ords: E708842.00 N782890.00

Location: Piperstown, Co. Louth	Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2
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Location Number TP-SUB	Location Type TP	Level 98.10m AoD	Logged By J.Ardern	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
[Pattern]		0.30			0.30	97.80	[Pattern]	Soft, brown, silty, sandy TOPSOIL
		0.50	B				[Pattern]	Stiff, greyish brown, slightly gravelly CLAY with a medium cobble and boulder content
		1.50	B				[Pattern]	
					1.80	96.30	[Pattern]	End of Pit at 1.800m

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	1.50	Sides stable upon completion	None	Shear Vane at 0.50m (106,110,104) kPa at 1.00m (128,110,118) kPa	0.00	1.80	Arisings

Remarks No groundwater encountered.	
--	--

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Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 06/02/2024
		Contractor:	Co-ords: E707338.00 N784036.00

Location: Piperstown, Co. Louth	Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2
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Location Number TP-T01	Location Type TP	Level 115.25m AoD	Logged By J.Ardern	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
[Pattern]		0.40	B		0.40	114.85	[Pattern]	Soft, brown, silty, sandy TOPSOIL
		0.50	B		0.80	114.45	[Pattern]	Medium dense, brown, slightly gravelly, clayey SAND
		1.00	B		1.20	114.05	[Pattern]	Extremely weak, dark grey, fine grained, distinctly weathered SILTSTONE / GREYWACKE

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	1.50	Sides stable upon completion	None		0.00	1.20	Arisings

Remarks No groundwater encountered.	
--	--

Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 05/02/2024
		Contractor:	Co-ords: E708057.00 N783557.00

Location: Piperstown, Co. Louth	Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2
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Location Number TP-T03	Location Type TP	Level 98.87m AoD	Logged By J.Ardern	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
[Pattern]					0.20	98.67	[Pattern]	Soft, brown, silty, sandy TOPSOIL	1
		0.50	B					Probable MADE GROUND: Dense, COBBLES and BOULDERS	
		1.20	B		1.00	97.87	[Pattern]	Extremely weak, dark grey, fine grained, distinctly weathered SILTSTONE / GREYWACKE	
					1.50	97.37		End of Pit at 1.500m	

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	1.50	Sides stable upon completion	None		0.00	1.50	Arisings

Remarks No groundwater encountered.	
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Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 05/02/2024
Location: Piperstown, Co. Louth		Contractor:	Co-ords: E708686.00 N783447.00
		Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2

Location Number TP-T04	Location Type TP	Level 90.60m AoD	Logged By J.Ardern	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
▼		0.30			0.30	90.30	[Diagonal Hatching]	Soft, brown, silty, sandy TOPSOIL
		0.70	B				[Circular Pattern]	Stiff, greyish brown, slightly gravelly CLAY with a low cobble and boulder content
		2.20	B		2.00	88.60	[Cross-hatching]	Extremely weak, dark grey, fine grained, distinctly weathered SILTSTONE / GREYWACKE
					3.00	87.60		End of Pit at 3.000m

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	1.50	Sides stable upon completion	None	Shear Vane at 0.50m (92,98,106) kPa at 1.00m (110,136,124) kPa	0.00	3.00	Arisings

Remarks
Groundwater encountered 2.0m b.g.l (Weak flow).



Project Name: Kellystown Wind Farm	Project No: 2200-23	Client: EDF Renewables	Date: 08/12/2022
Location: Piperstown, Co. Louth		Contractor:	Co-ords: E708339.94 N782821.00
		Sub Contractor: Gerry Kearns Plant Hire	Equipment: Takeuchi TB290-2

Location Number TP-T05	Location Type TP	Level 109.21m AoD	Logged By J.Stothers	Scale 1:25	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼	0.40			108.81		Soft, greyish brown, sandy TOPSOIL with medium cobble content.	
		1.00	B				Medium dense to dense, orangish brown mottled grey, gravelly, very clayey, fine to coarse SAND with a medium cobble and low boulder content.	
		2.80			106.41		Probable extremely weak, grey stained orangish black, distinctly weathered SILTSTONE / GREYWACKE	
		3.00	B		106.21		Excavated as; Dense BOULDERS with some orangish brown, clayey, sandy, fine to coarse GRAVEL with a medium cobble content. End of Pit at 3.000m	

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides stable upon completion	None		0.00	3.00	Arisings

Remarks
Groundwater encountered 2.8m b.g.l (Seepage).



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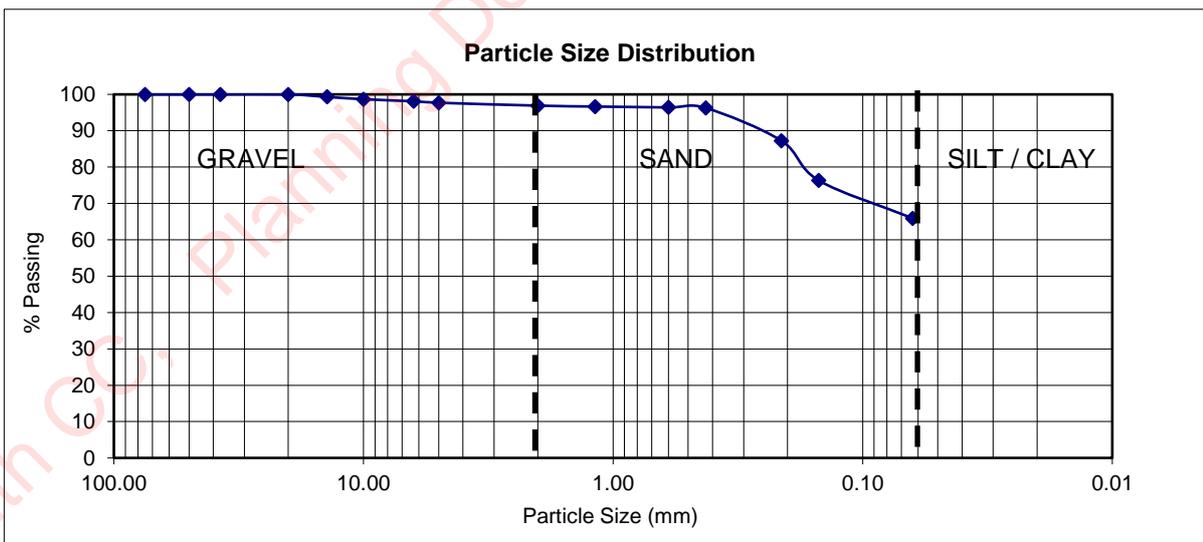
APPENDIX C

LABORATORY TESTING RESULTS

Partial Size Distribution	5 x A4
Moisture Content, Bulk and Dry Density	1 x A4
Sulphate Content of Water Extract, Chloride Content of Water Extract, Sulphide Content of Water Extract & pH	1 x A4
Point Load Tests on Rock Samples	1 x A4
Acid Test on Rock Samples	1 x A4

Particle Size Distribution

Location: Kellystown WF		Job ref:	2200-23	
Soil description: Sandy, SILT / CLAY		Borehole:	TP-A	
		Pit no.		
Test method BS 1377-2:1990:9.2/9.3/9.4/9.5*		Sample no.	1-50	
		Depth		
Initial dry mass (m1)		1847.10		
Mass of receiver (g)				
BS test sieve (mm)	Mass of dry soil + receiver (g)	Mass of dry soil retained (m2) (g)	Percentage retained (m2/m1)100	Cumulative percentage passing
75		0.00	0.00	100.00
50		0.00	0.00	100.00
37.5		0.00	0.00	100.00
20		0.00	0.00	100.00
14		12.90	0.70	99.30
10		11.70	0.63	98.67
6.3		10.70	0.58	98.09
5		7.20	0.39	97.70
2		14.80	0.80	96.90
1.18		4.50	0.24	96.65
0.6		4.50	0.24	96.41
0.425		2.90	0.16	96.25
0.212		166.00	8.99	87.27
0.15		202.30	10.95	76.31
0.063		191.90	10.39	65.92
Bottom tray		1217.70	65.92	0.00



Operator	Checked	Approved
LJ	JMcN	JW

VINI Geotechnical Testing

Determination of Particle Size Distribution
BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

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Sieve	%
Size mm	Passing
300.000	100
200.000	57.6535197
150.000	40.8487269
125.000	35.0
75.000	16.1
63.000	8.3
50.000	4.8
37.500	4.2
28.000	3.4
20.000	2.9
14.000	2.3
10.000	2.2
6.300	1.9
5.000	1.8
3.350	1.8
2.000	1.7
1.180	1.7
0.600	1.6
0.425	1.5
0.300	1.4
0.212	1.2
0.150	1.0
0.063	0.7



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel			91.7	0.0
	0.7			1.0			6.6				

Sample Description Gravel cont Cobbles

Project No. 2200-23

BH/TP No. TP-T02

Project Kellystown

Sample No.

Operator SS

Checked VS

Approved VS

Date sample tested

13/03/2024

Depth

0.8m

0
4241
5924
6513
8399
9188
9534

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VINI Geotechnical Testing

Determination of Particle Size Distribution
 BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

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Sieve	%
Size mm	Passing
300.000	100
200.000	39.7827903
150.000	39.7827903
125.000	39.8
75.000	21.2
63.000	20.0
50.000	14.4
37.500	13.3
28.000	11.6
20.000	9.0
14.000	7.6
10.000	4.8
6.300	3.4
5.000	3.0
3.350	2.5
2.000	1.9
1.180	1.5
0.600	1.2
0.425	1.1
0.300	1.0
0.212	0.9
0.150	0.9
0.063	0.8



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	0.8			1.1			18.1			80.0	0.0

Sample Description Gravel cont Cobbles

Project No. 2200-23

BH/TP No. TP-T03

Project Kellystown

Sample No.

Operator SS

Checked VS

Approved VS

Date sample tested

13/03/2024

Depth

1.2m

VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	69.7
50.000	58.6
37.500	37.2
28.000	22.8
20.000	18.6
14.000	17.9
10.000	17.2
6.300	15.3
5.000	14.2
3.350	13.2
2.000	12.1
1.180	11.1
0.600	9.9
0.425	9.4
0.300	8.9
0.212	8.4
0.150	7.9
0.063	7.5

Determination of Particle Size Distribution
BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel			30.3	0.0
	7.5			4.6			57.6				

Sample Description Silty sandy GRAVEL cont Cobbles

Project No. 2200-23

BH/TP No. TP-T4

Sample No.

Project Kellystown

Operator SS

Checked VS

Approved VS

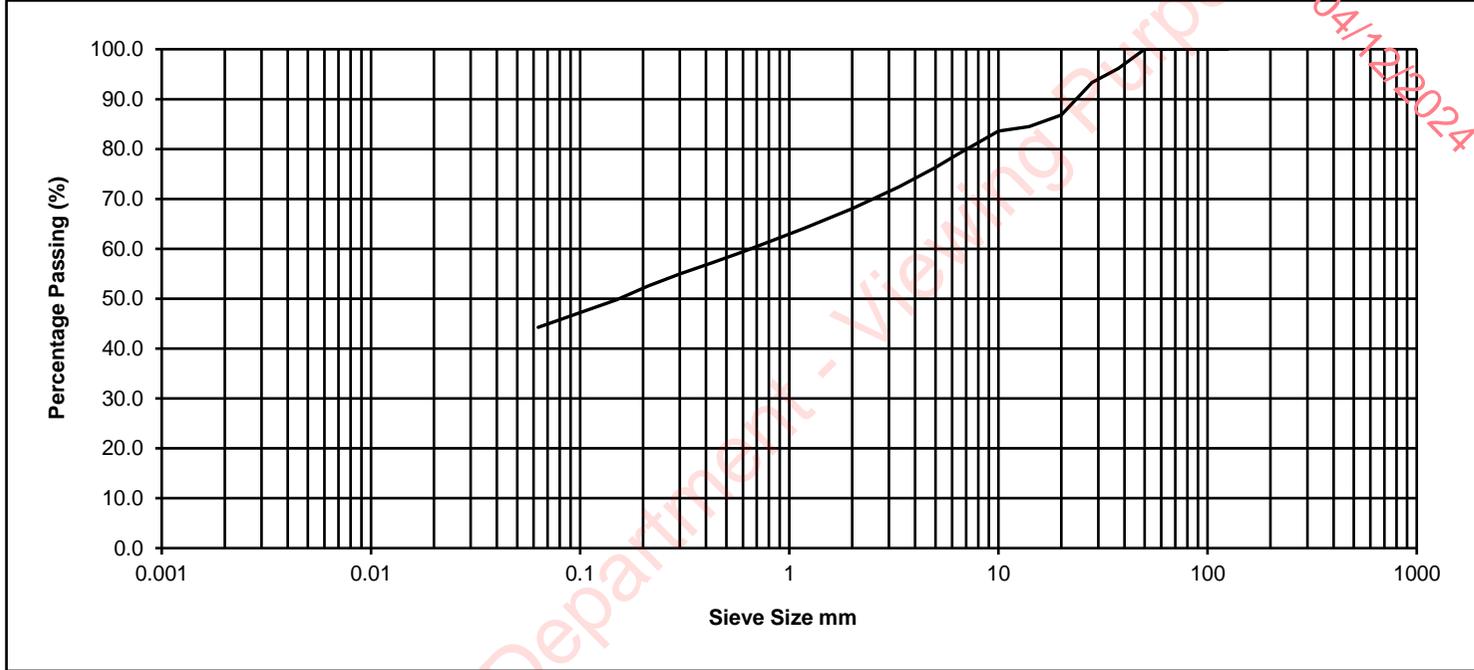
Date sample tested 13/03/2024

Depth 2.2m

VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	96.1
28.000	93.3
20.000	86.8
14.000	84.5
10.000	83.6
6.300	78.8
5.000	76.3
3.350	72.4
2.000	68.0
1.180	64.1
0.600	59.4
0.425	57.2
0.300	55.0
0.212	52.6
0.150	49.8
0.063	44.2

Determination of Particle Size Distribution
BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	44.2			23.8			32.0			0.0	0.0

Sample Description Gravelly sandy SILT

Project No. 2200-23

BH/TP No. TP-SUB

Project Kellystown

Sample No.

Operator SS

Checked VS

Approved VS

Date sample tested 13/03/2024

Depth 1.5m

Louth CC, Planning Department - Viewing Purposes Only! RECEIVED: 04/12/2024

Laboratory Results



Location: Kellystown WF

Job No: 2200-23

Client: EDF Renewables Ltd

Date: 08-04/2024

Sample no:	Depth (m)	Water Content (%)	Bulk Density kg/m3	Dry Density kg/m3
TP-A	1.50	15.7	2267	1774
TP-C	1.50	18.9	2357	1808
TP-D	1.50	18.4	2248	1772
TP-D	3.00	17.6	2345	1828
TP-SUB	1.50	15.2	2128	-
TP-T03	1.20	N/A	-	-
TP-T04	2.20	17.3	-	-
TP-T02	0.30	4.8	-	-

Operator	Checked	Approved
Dr S. Sivakumar	JM	WGS

Chemical Content Results



Location: Kellystown WF

Job No: 2200-23

Client: EDF Renewables Ltd

Date: 08/04/2024

Sample ID:	Depth (m)	Sulphate (mg/l)	Chloride (mg/l)	Sulphide (mg/l)	pH
TP-D	1.50	118	160	0.32	8.78
TP-SUB	1.50	2.0	2	<0.1	7.36
TP-04	2.20	2.3	4	<0.1	7.53
TP-08	0.30	<1.5	2	<0.1	7.08

Operator	Checked	Approved
Dr S. Sivakumar	JM	WGS

Point Load Testing



Location: Kellystown WF

Project No: 2200-23

Date:08/04/2024

Sample no:	Position	Sample Depth (m)	Diameter (mm) "D"	Max Load (kN) "P"	Point Load Strength (Mpa) " I_s "	Size Correction Factor (F)	Corrected Point Load Strength (MPa) " $I_{s(50)}$ "
TP-A	IL	0.06	0	2.23	0.56	1.00	0.56
TP-B	IL	0.07	0	5.24	1.32	1.00	1.32
TP-B	IL	0.05	0	2.22	0.56	1.00	0.56
TP-C	IL	0.05	0	5.32	1.34	1.00	1.34
TP-T05	IL	5.60	0	18.79	4.73	1.00	4.73

Operator	Checked	Approved
LJ	JMCN	JW

ASTM D5731-08

Acid test Results

Determination of carbonate mineral content and potential solubility



Location: Kellystown Wind Farm - Soils and Geology Study

Job No: 2200-23

Date: 08/04/2024

Operator	Checked	Approved
JS	JW	JM

Sample ID:	Rock Description	No reaction	Mild reaction	Strong reaction
TP-A	Grey fine grained SILTSONE / GREYWACKE (2.50m)	X		
TP-B	Grey fine grained SILTSONE / GREYWACKE (2.50m)	X		
TP-B	Grey fine grained SILTSONE / GREYWACKE (3.20m)	X		
TP-C	Grey fine grained SILTSONE / GREYWACKE (3.00m)	X		
TP-T05	Grey fine grained SILTSONE / GREYWACKE (3.00m)	X		

RECEIVED: 04/12/2024

APPENDIX D PHOTOGRAPHIC RECORD

Photographic Plates

Site Visit 1 (Dec 2022)

15 x A4

Site Visit 2 (Feb 2024)

8 x A4



Plate 1—Trial Hole TP-A



Plate 2—Trial Hole TP-A



Plate 3—Trial Hole TP-A



Plate 4—Trial Hole TP-A



Plate 5—Trial Hole TP-A



Plate 6—Trial Hole TP-A



Plate 7—Trial Hole TP-B



Plate 8—Trial Hole TP-B



Plate 9—Trial Hole TP-B



Plate 10—Trial Hole TP-B



Plate 11 - Trial Hole TP-B



Plate 12—Trial Hole TP-C



Plate 13 - Trial Hole TP-C



Plate 14—Trial Hole TP-C



Plate 15— Trial Hole TP-C



Plate 16—Trial Hole TP-C



Plate 17— Trial Hole TP-C



Plate 18— Trial Hole TP-D



Plate 19— Trial Hole TP-D



Plate 20—Trial Hole TP-D



Plate 21— Trial Hole TP-D



Plate 22—Trial Hole TP-D



Plate 23— Trial Hole TP-D



Plate 24— Trial Hole TP-05



Plate 25— Trial Hole TP-05



Plate 26— Trial Hole TP-05



Plate 27— Trial Hole TP-05



Plate 28—Trial Hole TP-05



Plate 29— Trial Hole TP-05



Plate 11—TP-01



Plate 12—TP-01



Plate 13—TP-03



Plate 14—TP-03



Plate 15—TP-04



Plate 16—TP-04



Plate 17—TP-02



Plate 18—TP-02



Plate 19—TP-SUB



Plate 20—TP-SUB



Plate 21—TP-SPRING1



Plate 22—TP-SPRING1



Plate 23—TP-SPRING2



Plate 24—TP-SPRING2



Plate 25—TP-SPRING2



Plate 26—TP-SPRING2