CAUSEWAY GEOTECH

24-1014

BALLYFASY WINDFARM
GROUND INVESTIGATION REPORT

Client:
TOBIN

Date:
MAY 2025

Status:
FINAL

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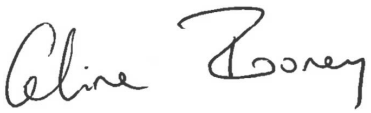
DOCUMENT CONTROL SHEET

REPORT NO:		**24-1014**			
PROJECT TITLE:		**BALLYFASY WIND FARM**			
CLIENT:		**TOBIN**			
REVISION:	**A00**	**STATUS**	**FINAL**	**ISSUE DATE**	**01/05/2025**
PREPARED BY:		**REVIEWED BY:**		**APPROVED BY:**	
 Rabie Mohamed		 Gabriella Horan **BSc Earth Science**		 Celine Rooney **BSc MSc PGeo (EurGeol)**	

This report presents a factual account of the ground investigation in accordance with the Specification and Related Documents for Ground Investigation in Ireland 2nd Edition, published by Engineers Ireland (2016), along with a preliminary geotechnical assessment.

METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015+A1:2020, The Code of Practice for Ground Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler).
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler).
P	Nominal 100mm diameter undisturbed piston sample.
B	Bulk disturbed sample.
LB	Large bulk disturbed sample.
SB	Sonic bulk disturbed sample.
D	Small disturbed sample.
C	Core sub-sample (displayed in the Field Records column on the logs).
L	Liner sample from dynamic sampled borehole.
W	Water sample.
ES / EW	Soil sample for environmental testing / Water sample for environmental testing.
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained).
SPT (c)	Standard penetration test using 60 degree solid cone.
(x,x/x,x,x,x)	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.
(Y for Z/ Y for Z)	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given seating or test length 'Z' (mm).
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm).
HVP / HVR	Uncorrected in situ hand vane peak (HVP) and residual (HVR) result presented in kPa. Vane calibration factor has been applied, but no correction made for soil type.
V VR	Shear vane test (borehole). Shear strength stated in kPa. V: undisturbed vane shear strength VR: remoulded vane shear strength
Soil consistency description	In cohesive soils, where samples are disturbed and there are no suitable laboratory tests, N values may be used to indicate consistency on borehole logs – a median relationship of Nx5=Cu is used (as set out in Stroud & Butler 1975).
dd-mm-yyyy	Date at the end and start of shifts, shown at the relevant borehole depth. Corresponding casing and water depths shown in the adjacent columns.
▽	Water strike: initial depth of strike.
▼	Water strike: depth water rose to.
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015+A1:2020	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum) measured in millimetres.

1 AUTHORITY

On the instructions of Tobin (the "Client"), a ground investigation was undertaken at the site to provide geotechnical information for input to the design and construction of a proposed windfarm.

This report details the work carried out both on site and in the geotechnical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results.

All information given in this report is based upon the ground conditions encountered during the ground investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

2 PURPOSE, RATIONALE & SCOPE OF THE INVESTIGATION

The purpose of this investigation is to assess the ground conditions and to allow an evaluation of the geotechnical issues with the current site and proposed development.

The rationale has been determined by the Client, with the extent of the investigation including a borehole, trial pits, in-situ testing, soil and rock core sampling, laboratory testing, and the preparation of a report on the findings including recommendations for construction.

3 DESCRIPTION OF SITE

The site is located at Irish Transverse Mercator 661711 625716 Ballyfasy Upper, Co Kilkenny. The site location is presented in Appendix A and a summary of the surrounding land uses is provided in Table 1.

Table 1: Summary of surrounding land uses

Location	Description
North	Agricultural land.
East	Residential premises, Agricultural land.
South	Agricultural land.
West	Agricultural land, Three friars cross road.

4 SITE OPERATIONS

4.1 SUMMARY OF SITE WORKS

Site operations, which were conducted between 29th October 2024 and 7th March 2025, comprised:

- one rotary drilled borehole
- eight gouge augers
- fourteen machine-dug trial pits
- GPS survey of all completed locations

The exploratory holes and in-situ tests were located as instructed by the Client, and as shown on the exploratory hole location plan in Appendix A.

4.2 BOREHOLES

One borehole (BH01) was put to completion by rotary drilling techniques only. The borehole was completed using a Comacchio 602 tracked rotary drilling rig.

A hand dug inspection pit was carried out between ground level and 1.20m depth to ensure borehole was put down at a location clear of services or subsurface obstructions.

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the borehole to bedrock, after which rotary coring was employed to recover core samples of the bedrock.

The core was extracted in up to 1.50m lengths using a metric T2-101 core barrel, which produced core of nominal 84mm diameter, and was placed in triple channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with BS 5930: 2015+A1:2020: Code of practice for ground investigations.

Appendix B presents the borehole logs, with core photographs presented in Appendix C.

4.3 GOUGE AUGERS

Eight gouge augers were conducted at locations shown in Appendix A using an Edelman hand auger to depths ranging from 0.30-1.00m.

Appendix D presents the gouge auger logs.

4.4 TRIAL PITS

Fourteen trial pits (TP01-TP03, TP05-TP15) were excavated using an 13t tracked excavator fitted with a 1000mm wide bucket, to depths of 1.30-4.00m. Hand vane tests were carried out where possible in cohesive soil.

Any water strikes encountered during excavation were recorded and the stability of the trial pit walls was

noted on completion.

Appendix E presents the trial pit logs with photographs of the pits and arisings provided in Appendix F.

4.5 SURVEYING

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R10 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish Transverse Mercator) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole location plan presented in Appendix A shows these as-built positions.

5 LABORATORY WORK

Laboratory testing was carried out between 28th January and 01st April 2025.

5.1 GEOTECHNICAL LABORATORY TESTING OF SOILS

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.
- **compaction related:** dry density/moisture content relationship.
- **soil chemistry:** pH.

Laboratory testing of soils samples was carried out in accordance with BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (BSI, 2016), and Part 2 (BSI, 2022).

The test results are presented in Appendix G.

5.2 GEOTECHNICAL LABORATORY TESTING OF ROCK

Laboratory testing of rock sub-samples comprised:

- point load index
- slake durability index

Laboratory testing of rock sub-samples was carried out in accordance with the testing standards presented below in Table 2.

Table 2: Rock testing standards

Test	Test carried out in accordance with
Point load index	International Society for Rock Mechanics (IRSM). (1985) ISRM Suggested Methods: Suggested method for determining point-load strength. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. 22, pp. 53–60
Slake Durability Index	ISRM Suggested Methods– Rock CharacterizationTesting and Monitoring. Ed. ET Brown – 1981

The test results are presented in Appendix G.

6 GROUND CONDITIONS

6.1 GENERAL GEOLOGY OF THE AREA

Published geological mapping from the online Geological Survey Ireland spatial resources database indicate the superficial deposits underlying the site comprise of Glacial till derived from Lower Palaeozoic shales. These deposits are shown to be underlain by green and grey slate with thin siltstone from the Ballylane Formation.

6.2 GROUND TYPES ENCOUNTERED DURING INVESTIGATION OF THE SITE

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Topsoil:** encountered typically in 200-300mm thickness across the site.
- **Glacial Till:** sandy gravelly clay, sandy gravelly silt or sandy clayey gravel, frequently with low to high cobble content, typically soft in upper horizons, becoming stiff with increasing depth.
- **Bedrock (MUDSTONE & SHALE):** Rockhead was encountered at two locations on site at depths ranging from 1.45m in TP07 to 2.30m in BH01.

Further details of these ground types, including their specific depths and descriptions, can be found on the individual exploratory hole logs accompanying this report.

6.3 GROUNDWATER

Groundwater was not noted during drilling at the borehole location. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out.

It should be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Groundwater was noted in TP11, TP12 & TP15.

Seasonal variation in groundwater levels should also be factored into design considerations.

7 DISCUSSION

7.1 PROPOSED CONSTRUCTION

It is proposed to construct a wind farm.

No further details were available to Causeway Geotech at the time of preparing this report and any designs based on the recommendations or conclusions within this report should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory holes. Causeway Geotech were commissioned to provide a geotechnical report, and it is outwith our remit to advise on structure design.

7.2 RECOMMENDATIONS FOR CONSTRUCTION

7.2.1 SUMMARY

Based on the presence of dense gravel at relatively shallow depth in BH01, the implementation of traditional shallow (spread) foundations (strip/pad) are considered suitable.

7.2.2 SOIL STRENGTH PARAMETERS

When estimating the shear strength of fine soils (silt/clay), reference is made to the results of Standard Penetration Tests (SPT's) carried out within the boreholes. The undrained shear strength of fine soils can be estimated using the correlation developed by Stroud & Butler:

$C_u = f_1 \times N$

where f_1 is typically in the range 4 to 6. A median f_1 value of 5 is adopted for this report.

For granular soils (sand/gravel), a graphical relationship between SPT "N" value and angle of shearing resistance, φ, has been developed by Peck, Hanson and Thorburn. This is published in *Foundation Design and Construction* (Tomlinson, 2001) and is referenced in this report when deriving angles of shearing resistance for the gravel soils.

7.2.3 FOUNDATIONS

Foundations should transfer loading to below any loose subsoil. The recommended foundation construction and allowable bearing pressure (ABP) at the borehole location is presented in Table 3.

Table 3: Construction Recommendations

Borehole	Depth below EGL* to suitable bearing stratum	Estimated ABP (kPa)	Stratum description	Foundation type	Groundwater
BH01	1.20m	200	GRAVEL	Strip & pad	Not encountered

Based on the findings of the ground investigation, spread foundations (strip/pad) are considered suitable with estimated allowable bearing pressure of 200kPa at a depth of 1.20m in BH01. It should be noted

trial pits in the greater site area (TP01-TP03, TP04-TP06, TP12 & TP14-TP15) reached up to 4.00m without encountering bedrock.

The base of foundation excavations should be thoroughly inspected in accordance with the Earthworks Specification; any soft soils should be removed with the resultant void backfilled with ST1 concrete. A consistent bearing stratum should be provided for any building unit to limit differential settlements.

Given the generally cohesive nature of the soils throughout the proposed formation levels, excavations for foundations are likely to be relatively stable. However, any instability can be minimised by battering the side slopes at 1 vertical to 2 horizontal and by limiting the duration that the excavation is open. Groundwater control, where required, will be possible by pumping from sumps formed in the base of excavations.

7.2.4 EXCAVATIONS FOR SERVICES

For the installation of services ducts/trenches, it is suggested that open trenching will be the most practicable construction method. Generally speaking, the ground conditions should render the use of open trenching by backhoe excavator possible.

Where working in open trenches, it is thought that trench support systems, by way of a trench box (or possibly sheet piles), will be required to maintain trench stability and safe working conditions. Groundwater control at these locations should be possible by means of sump pumping.

To preclude the eventuality of differential settlements in pipes, they should be laid on a consistent stratum of appropriate allowable bearing capacity and protected with appropriate fill cover.

Where ducts and chambers must be installed in areas where localised soft spots are encountered, the use of geogrid reinforcement along the base of the excavation is recommended. This will stiffen the base of the trench and help control longitudinal differential settlement.

Backfilling of trenches may be completed by using compacted Cl 804 granular fill and reinstated as appropriate.

8 REFERENCES

British Standards Institute (BSI). (2016) BS 1377-1:2016: Methods of test for soils for civil engineering purposes. Part 1: General requirements and sample preparation.

British Standards Institute (BSI). (2022) BS 1377-2:2022: Methods of test for soils for civil engineering purposes. Part 2: Classification tests and determination of geotechnical properties.

British Standards Institute (BSI). (2007) BS EN 1997-2:2007: Eurocode 7 – Geotechnical Design – Part 2: Ground investigation and testing.

British Standards Institute (BSI). (2018a) BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

British Standards Institute (BSI). (2018b) BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

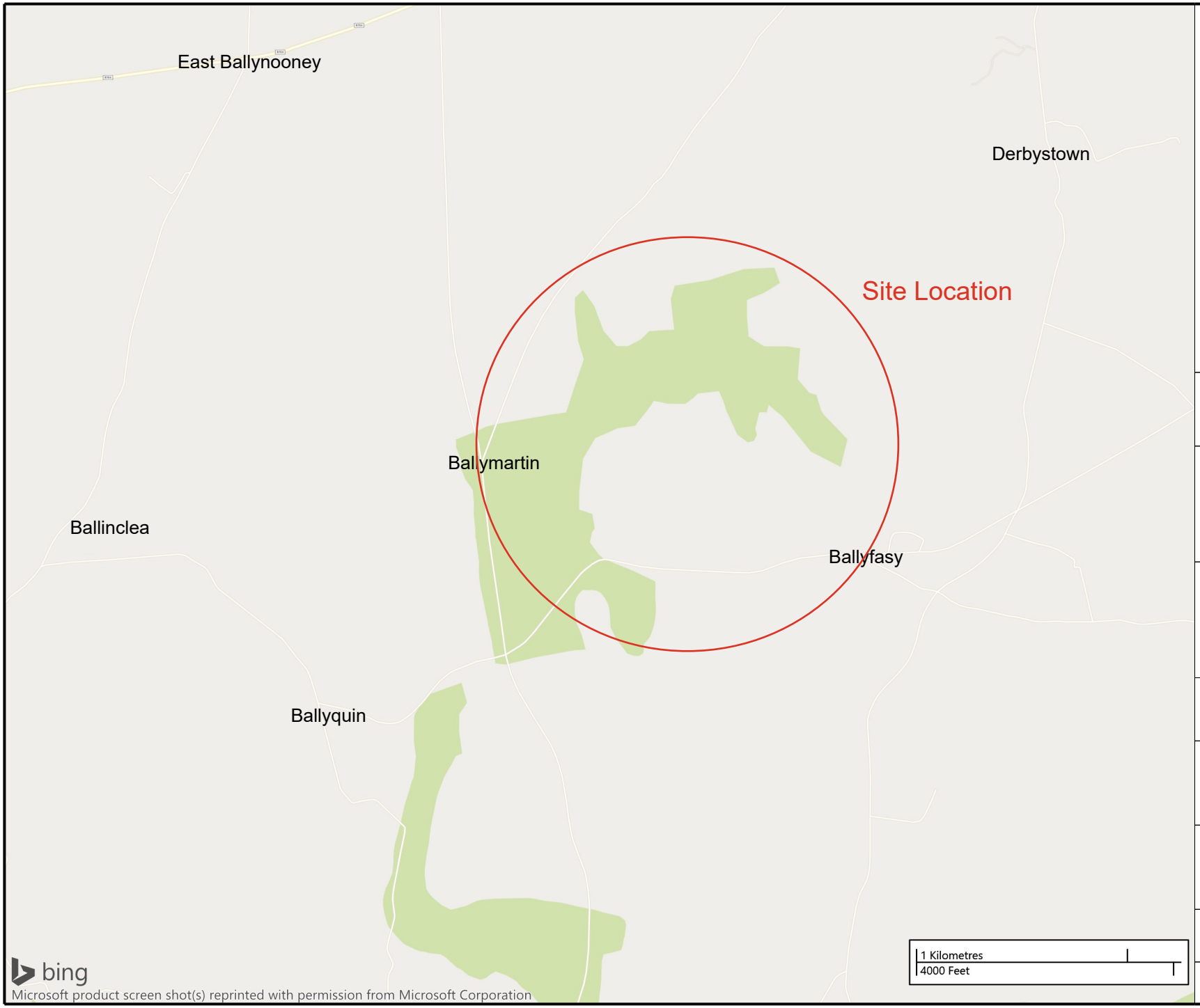
British Standards Institute (BSI). (2018c) BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.

British Standards Institute (BSI). (2020) BS5930:2015+A1:2020: Code of practice for ground investigations.

Geotechnical Society of Ireland. (2016) Specification and Related Documents for Ground Investigation in Ireland. 2nd Edition. Engineers Ireland.

Geological Survey Ireland (GSI). Geological Survey Ireland spatial resources database. Available at: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228

APPENDIX A – SITE AND EXPLORATORY HOLE LOCATION PLANS



Legend Key

Project No.	24-1014
Client	Tobin
Client's Rep	N/A

Site Location Plan

Ballyfasy Wind Farm

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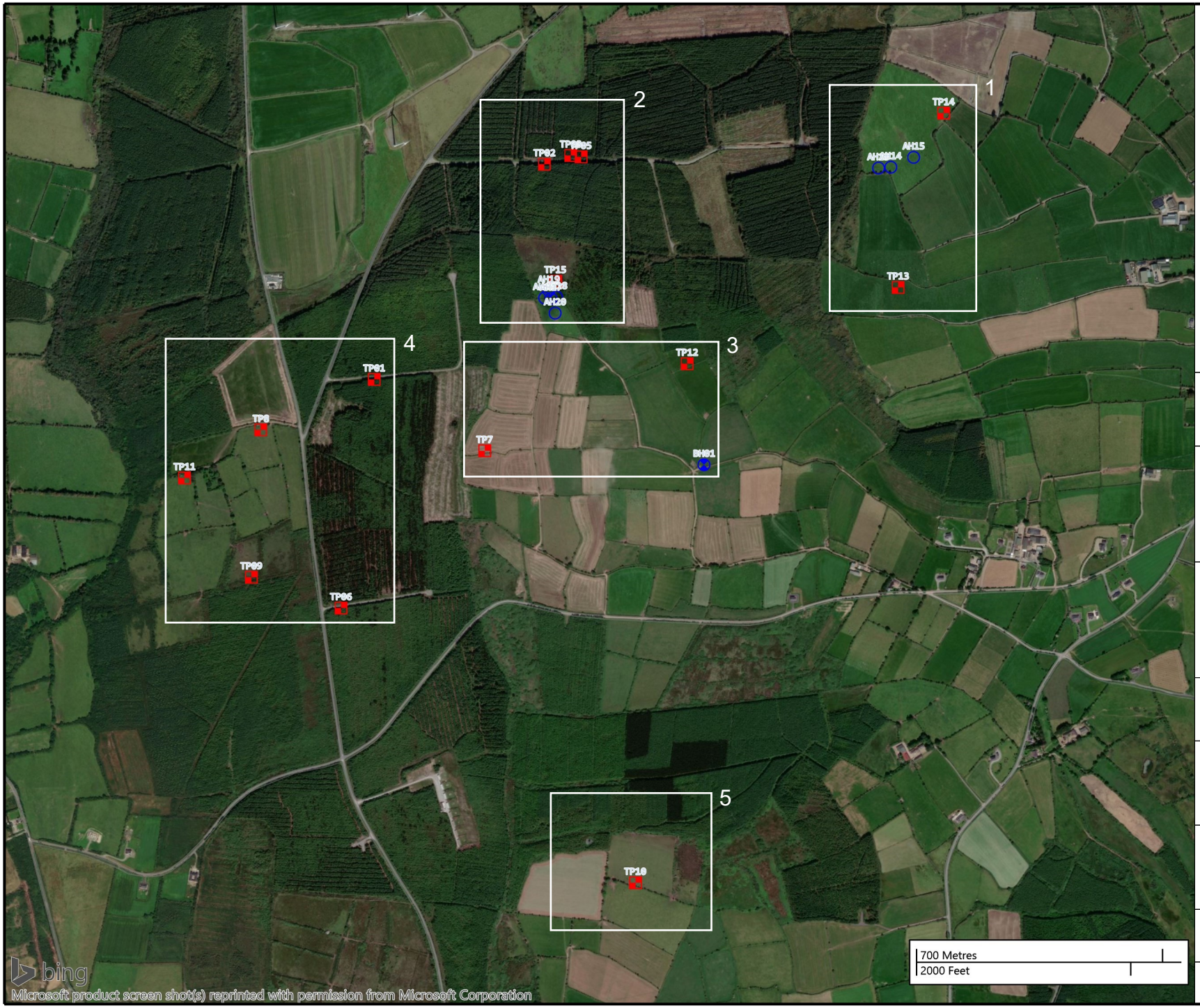
Last Revision	14/04/2025
Scale	1:25000



Legend Key

- Hand augering
- Rotary drilling
- Trial Pit

Note: Exploratory hole location TP09 is approximate and generated using the logging software.

Project No.	24-1014
Client	Tobin
Client's Rep	N/A

Exploratory Hole Location Plan Overview

Ballyfasy Wind Farm

CAUSEWAY GEOTECH

Last Revision	14/04/2025
Scale	1:15000

Legend Key

- Hand augering
- Rotary drilling
- Trial Pit

Note: Exploratory hole location TP09 is approximate and generated using the logging software.

Project No.	24-1014
Client	Tobin
Client's Rep	N/A

Exploratory Hole Location Plan 1

Ballyfasy Wind Farm

CAUSEWAY GEOTECH

Last Revision	14/04/2025
Scale	1:3000

Legend Key

- Hand augering
- Rotary drilling
- Trial Pit

Note: Exploratory hole location TP09 is approximate and generated using the logging software.

Project No.	24-1014
Client	Tobin
Client's Rep	N/A

Exploratory Hole Location Plan 2

Ballyfasy Wind Farm

CAUSEWAY GEOTECH

Last Revision	14/04/2025
Scale	1:3000

Legend Key

- Hand augering
- Rotary drilling
- Trial Pit

Note: Exploratory hole location TP09 is approximate and generated using the logging software.

Project No.	24-1014
Client	Tobin
Client's Rep	N/A

Exploratory Hole Location Plan 3

Ballyfasy Wind Farm

CAUSEWAY GEOTECH

Last Revision	14/04/2025
Scale	1:3000

Legend Key

- Hand augering
- Rotary drilling
- Trial Pit

Note: Exploratory hole location TP09 is approximate and generated using the logging software.

Project No.	24-1014
Client	Tobin
Client's Rep	N/A

Exploratory Hole Location Plan 4

Ballyfasy Wind Farm

CAUSEWAY GEOTECH

Last Revision	14/04/2025
Scale	1:4000

Legend Key

- Hand augering
- Rotary drilling
- Trial Pit

Note: Exploratory hole location TP09 is approximate and generated using the logging software.

Project No.	24-1014
Client	Tobin
Client's Rep	N/A

Exploratory Hole Location Plan 5

Ballyfasy Wind Farm

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Last Revision	14/04/2025
Scale	1:3000

APPENDIX B – BOREHOLE LOGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-1014	Ballyfasy Wind Farm	BH01
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Rotary Drilling	Comacchio 602	0.00	2.30	
Rotary Coring	Comacchio 602	2.30	6.80	661759.26 E
				625429.48 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 1
6.80 m	06/03/2025	TA	Scale: 1:50
Elevation: 200.38 mOD	**End Date:** 07/03/2025	**Logger:** EGA	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					199.98	0.40		TOPSOIL		
								Sandy gravelly CLAY. (Drillers description)		
					199.18	1.20		Weathered SHALE (Drillers description)		
		TCR 100 SCR 96 RQD 35 FI 17			198.08	2.30		Moderately weak thinly laminated light orangish brown SHALE. Distinctly weathered: reduced strength closer fracture spacing. Discontinuities: 1. Sub-horizontal joints closely spaced (60/80/140) planar, smooth, unstained. 2. 30-55 degree joints medium spaced (70/240/1050) planar smooth unstained.		
3.80		TCR 100 SCR 87 RQD 30 FI >20								
		FI 16								
5.50		FI >20								
		TCR 100 SCR 81 RQD 36 FI 18			194.48	5.90		Moderately weak thinly laminated greyish brown SHALE with medium spaced quartz veins. Distinctly weathered: reduced strength closer fracture spacing. Discontinuities: 1. Sub-horizontal joints closely spaced (40/60/260) planar smooth with film of clay on various surfaces. *Stratum exhibits medium spaced quartz veins up to 200mm thick*		
6.80					193.58	6.80		End of Borehole at 6.80m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)

Water Added

From (m)	To (m)

Remarks

Inspection pit hand dug to 1.20m.
No groundwater encountered.

Core Barrel	Flush Type	Termination Reason	Last Updated
T2-101	Water	Terminated at scheduled depth.	27/04/2025

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APPENDIX C – CORE PHOTOGRAPHS

BH01 Box 1 Depth (2.30-3.80m)

BH01 Box 2 Depth (3.80-5.30m)

BH01 Box 3 Depth (5.30-6.80m)

APPENDIX D – GOUGE AUGER LOGS

CAUSEWAY GEOTECH

Project No.	Project Name: Ballyfasy Wind Farm	Borehole ID
24-1014	Client: Tobin	AH13
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 1.00 m	Start Date: 30/10/2024	Driller: JA	Sheet 1 of 1
Hand Augering	Gouge Auger	0.00	1.00	662247.61 E 626283.72 N	Elevation: 167.63 mOD	End Date: 30/10/2024	Logger: GH	Scale: 1:50 FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					167.42	0.20		TOPSOIL: Sandy CLAY		
					167.22	0.40		Soft sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
					167.02	0.60		Soft sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
1.00	D1				166.62	1.00		Soft to firm sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
								End of Borehole at 1.00m		

Water Strikes				Casing Details		Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter	

Termination Reason	Last Updated
Terminated on refusal	14/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-1014	Ballyfasy Wind Farm	AH14
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Gouge Auger	0.00	0.40	662282.66 E 626286.68 N	0.40 m	30/10/2024	JA	Scale: 1:50
					Elevation: 167.73 mOD	End Date: 30/10/2024	Logger: GH	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					167.53	0.20		TOPSOIL		
0.40	D1				167.33	0.40		Soft to firm sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
								End of Borehole at 0.40m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated on refusal

Last Updated

14/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name: Ballyfasy Wind Farm			Borehole ID
24-1014	Client: Tobin			AH15
	Client's Rep: N/A			

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth: 0.40 m	Start Date: 30/10/2024	Driller: JA	Sheet 1 of 1
Hand Augering	Gouge Auger	0.00	0.40	662348.63 E 626315.58 N	Elevation: 168.01 mOD	End Date: 30/10/2024	Logger: GH	Scale: 1:50 FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					167.80	0.20		TOPSOIL: Firm sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
0.40	D1				167.60	0.40		Firm sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
								End of Borehole at 0.40m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated on refusal

Last Updated

14/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-1014	Ballyfasy Wind Farm	AH16
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Gouge Auger	0.00	0.40	661294.99 E	0.40 m	30/10/2024	JA	Scale: 1:50
				625900.46 N	Elevation: 194.28 mOD	End Date: 30/10/2024	Logger: GH	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					194.08	0.20		TOPSOIL		
0.40	D1				193.88	0.40		Sandy gravelly CLAY with fragments of rock. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
								End of Borehole at 0.40m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated on refusal

Last Updated

14/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-1014	Ballyfasy Wind Farm	AH17
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Gouge Auger	0.00	0.35	661314.89 E 625899.21 N	0.35 m	30/10/2024	JA	Scale: 1:50
					Elevation: 194.76 mOD	End Date: 30/10/2024	Logger: GH	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					194.56	0.20		TOPSOIL		
0.35	D1				194.41	0.35		Orangish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
								End of Borehole at 0.35m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated on refusal

Last Updated

14/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-1014	Ballyfasy Wind Farm	AH18
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Gouge Auger	0.00	0.35	661329.79 E 625903.74 N

Final Depth:	0.35 m	**Start Date:** 30/10/2024	**Driller:** JA	Sheet 1 of 1 Scale: 1:50
Elevation:	194.60 mOD	**End Date:** 30/10/2024	**Logger:** GH	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
					194.40	0.20		Topsoil		
0.35	D1				194.25	0.35		Brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
								End of Borehole at 0.35m		

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diameter

Remarks

Termination Reason

Terminated on refusal

Last Updated

14/04/2025

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-1014	Ballyfasy Wind Farm	AH19
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Hand Augering	Gouge Auger	0.00	0.30	661308.21 E 625921.83 N

Final Depth:	0.30 m	**Start Date:** 30/10/2024	**Driller:** JA	Sheet 1 of 1 Scale: 1:50
Elevation:	194.56 mOD	**End Date:** 30/10/2024	**Logger:** GH	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				194.36 194.26	0.20 0.30		TOPSOIL Orangish brown sandy gravelly CLAY with stone fragments. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. End of Borehole at 0.30m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated on refusal

Last Updated

14/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
24-1014	Ballyfasy Wind Farm	AH20
	Client: Tobin	
	Client's Rep: N/A	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 1
Hand Augering	Gouge Auger	0.00	0.30	661326.73 E 625857.50 N	0.30 m	30/10/2024	JA	Scale: 1:50
					Elevation: 196.01 mOD	End Date: 30/10/2024	Logger: GH	FINAL

Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.30	D1				195.81 195.71	0.20 0.30		TOPSOIL Sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. End of Borehole at 0.30m		

Water Strikes				Casing Details	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	To (m)	Diameter

Remarks

Termination Reason

Terminated on refusal

Last Updated

14/04/2025

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APPENDIX E – TRIAL PIT LOGS

CAUSEWAY GEOTECH

Project No. 24-1014	**Project Name:** Ballyfasy Wind Farm		**Trial Pit ID** TP01
Coordinates 660810.85 E 625661.63 N	**Client:** Tobin		
Method: Trial Pitting	**Client's Representative:** N/A		Sheet 1 of 1 Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 183.62 mOD	**Date:** 27/02/2025	**Logger:** HW	FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			183.32	0.30		TOPSOIL: with coarse roots (>5mm).	
1.00	B1					Firm light greyish brown sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
2.00	B2		181.62	2.00		Stiff light brown sandy CLAY with low cobble content. Sand is fine to coarse. Cobbles are subrounded.	
3.00	B3						
4.00	B4		179.62	4.00		End of trial pit at 4.00m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 4.00
Width: 1.30
Length: 4.00

Remarks:
Not suitable for hand vane.

Stability:
Stable

Termination Reason
Terminated at scheduled depth.

Last Updated
30/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
24-1014	Ballyfasy Wind Farm	TP02
Coordinates	**Client:**	
661291.09 E	Tobin	
626282.78 N	**Client's Representative:**	Sheet 1 of 1
	N/A	Scale: 1:25
Elevation	**Date:** / **Logger:**	
196.81 mOD	27/02/2025 / HW	FINAL

Method: Trial Pitting

Plant: 13t Tracked Excavator

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			196.51	0.30		TOPSOIL: with coarse roots (>5mm).	
1.00	B1					Very soft light brown slightly gravelly very sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
2.00	B2		194.81	2.00		Soft light brown slightly gravelly very sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
3.00	B3		193.81	3.00		Stiff light brown sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
4.00	B4		192.81	4.00		End of trial pit at 4.00m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 4.00
Width: 1.30
Length: 4.00

Remarks: Not suitable for hand vane.

Stability: Stable

Termination Reason: Terminated at scheduled depth.

Last Updated: 30/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
24-1014	Ballyfasy Wind Farm	TP03
Coordinates	**Client:**	
661366.07 E	Tobin	
626308.65 N	**Client's Representative:**	Sheet 1 of 1
	N/A	Scale: 1:25
Method: Trial Pitting		
Plant: 13t Tracked Excavator	**Elevation** 195.96 mOD	**Date:** 27/02/2025 **Logger:** HW
		FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			195.66	0.30		TOPSOIL: with coarse roots (>5mm).	
1.00	B1					Soft light brown slightly gravelly very sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
2.00	B2		193.96	2.00		Firm light brown slightly gravelly very sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
3.00	B3		192.96	3.00		Firm light brown sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
4.00	B4		191.96	4.00		End of trial pit at 4.00m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 4.00
Width: 1.30
Length: 4.10

Remarks:
Not suitable for hand vane.

Stability:
Stable

Termination Reason
Terminated at scheduled depth.

Last Updated
30/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
24-1014	Ballyfasy Wind Farm	TP05
Coordinates	**Client:** Tobin	
661394.82 E 626304.94 N	**Client's Representative:** N/A	Sheet 1 of 1 Scale: 1:25
Elevation 195.23 mOD	**Date:** 27/02/2025	**Logger:** HW — FINAL

Method: Trial Pitting

Plant: 13t Tracked Excavator

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			194.93	0.30		TOPSOIL: with coarse roots (>5mm).	
1.00	B1		194.23	1.00		Soft light brown slightly gravelly very sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
2.00	B2		193.23	2.00		Soft light brown slightly gravelly very sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
3.00	B3					Stiff light brown sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
4.00	B4		191.23	4.00		End of trial pit at 4.00m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 4.00
Width: 1.30
Length: 4.00

Remarks: Not suitable for hand vane.

Stability: Stable

Termination Reason: Terminated at scheduled depth.

Last Updated: 30/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
24-1014	Ballyfasy Wind Farm	TP06
Coordinates	**Client:**	
660723.95 E	Tobin	
625007.13 N	**Client's Representative:**	Sheet 1 of 1
	N/A	Scale: 1:25
Method: Trial Pitting		
Plant: 13t Tracked Excavator	**Elevation** 168.07 mOD	**Date:** 27/02/2025 **Logger:** HW
		FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			167.77	0.30		TOPSOIL: with coarse roots (>5mm).	
						Soft light brown slightly gravelly very sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
1.00	B1		167.07	1.00		Firm light greyish brown sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
2.00	B2						
3.00	B3		165.07	3.00		Stiff light greyish brown sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
4.00	B4		164.07	4.00		End of trial pit at 4.00m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 4.00
Width: 1.30
Length: 4.10

Remarks:
Not suitable for hand vane.

Stability:
Stable

Termination Reason
Terminated at scheduled depth.

Last Updated
30/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
24-1014	Ballyfasy Wind Farm	TP07
Coordinates	**Client:** Tobin	
661129.40 E 625461.51 N	**Client's Representative:** N/A	Sheet 1 of 1 Scale: 1:25
Elevation 186.90 mOD	**Date:** 30/10/2024	**Logger:** RS

Method: Trial Pitting

Plant: 13t Tracked Excavator

FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			186.60	0.30		TOPSOIL:	
0.50	B1		186.30	0.60		Firm light brown slightly sandy slightly gravelly CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles and boulders are subrounded up to 370mm in diameter.	
1.00	B2					Firm light brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular fine to coarse. Cobbles are angular.	
			185.45	1.45		Very weak very thinly laminated light brown MUDSTONE. Highly weathered: probably greatly reduced strength and much closer fracture spacing.	
3.00	B3		183.80	3.10		End of trial pit at 3.10m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 3.10
Width: 1.00
Length: 5.00

Remarks: Hand vane not possible. No groundwater encountered.

Stability: Unstable below 1.45

Termination Reason: Terminated at refusal on boulder / possible bedrock.

Last Updated: 30/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
24-1014	Ballyfasy Wind Farm	TP08
Coordinates	**Client:**	
660488.00 E	Tobin	
625513.36 N	**Client's Representative:**	Sheet 1 of 1
Method: Trial Pitting	N/A	Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 165.45 mOD	**Date:** 29/10/2024 **Logger:** RS — FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			165.25	0.20		TOPSOIL:	
			165.15	0.30		Stiff orangish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse.	
0.50	B1					Orangish brown very sandy very silty angular fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. Cobbles are angular.	
1.50	B2						
2.50	B3						
			162.55	2.90		End of trial pit at 2.90m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 2.90
Width: 1.00
Length: 4.00

Remarks:
Hand vane not possible. No groundwater encountered

Stability:
Stable

Termination Reason
Terminated at refusal on boulder / possible bedrock.

Last Updated
30/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
24-1014	Ballyfasy Wind Farm	TP09
Coordinates	**Client:** Tobin	
660466.00 E 625092.00 N	**Client's Representative:** N/A	Sheet 1 of 1 Scale: 1:25
Method: Trial Pitting		
Plant: 13t Tracked Excavator	**Elevation** mOD / **Date:** 27/02/2025 / **Logger:** HW	FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
				0.20		TOPSOIL: with fine roots (0.5-2.0mm).	
1.00	B1					Firm light greyish brown slightly gravelly very sandy CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
2.00	B2			2.00		Stiff light greyish brown sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
3.00	B3						
3.90	B4			3.90		End of trial pit at 3.90m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 3.90
Width: 1.30
Length: 3.90

Remarks:
Not suitable for hand vane.
Coordinates are approximate and generated using logging software.

Stability: Stable

Termination Reason: Terminated at refusal on stiff clay.

Last Updated: 30/04/2025

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CAUSEWAY GEOTECH	**Project No.** 24-1014	**Project Name:** Ballyfasy Wind Farm	**Trial Pit ID** **TP10**
	Coordinates 661576.49 E 624232.11 N	**Client:** Tobin	
Method: Trial Pitting		**Client's Representative:** N/A	Sheet 1 of 1 Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 163.46 mOD	**Date:** 30/10/2024 **Logger:** RS	FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
						TOPSOIL:	
			163.26	0.20		Firm orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	
			163.06	0.40		Stiff light brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to medium. Cobbles are subangular.	
0.50	B1						
0.50		HVP=78, HVR=9					
0.50		HVP=80, HVR=5					
0.50		HVP=84, HVR=7					
1.00		HVP=120, HVR=12					
1.00		HVP=144, HVR=18					
1.00		HVP=210, HVR=48					
1.50	B2						
			161.66	1.80		End of trial pit at 1.80m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 1.80
Width: 1.00
Length: 5.00

Remarks:
No groundwater encountered.

Stability:
Moderately stable

Termination Reason
Terminated at refusal on boulder / possible bedrock.

Last Updated
30/04/2025

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CAUSEWAY GEOTECH

Project No. 24-1014	**Project Name:** Ballyfasy Wind Farm		**Trial Pit ID** TP11
Coordinates 660271.03 E 625373.25 N	**Client:** Tobin		
Method: Trial Pitting	**Client's Representative:** N/A		Sheet 1 of 1 Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 154.97 mOD	**Date:** 29/10/2024	**Logger:** RS	FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			154.77	0.20		TOPSOIL:	
			154.57	0.40		Stiff orangish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular.	
0.50	B1					Stiff pinkish brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to medium. Cobbles are subangular.	
1.50	B2						
			152.77	2.20		Pinkish brown very sandy very silty angular fine to coarse GRAVEL with high cobble content. Sand is fine to coarse. Cobbles are subangular.	
2.50	B3	Fast flow					▼
			152.17	2.80		End of trial pit at 2.80m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks
2.70	Fast flow

Depth: 2.80
Width: 1.00
Length: 4.00

Remarks:
Hand vane not possible.

Stability:
Stable

Termination Reason
Terminated at refusal on boulder / possible bedrock.

Last Updated
30/04/2025

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CAUSEWAY GEOTECH

Project No. 24-1014	**Project Name:** Ballyfasy Wind Farm		**Trial Pit ID** TP12
Coordinates 661706.74 E 625717.68 N	**Client:** Tobin		
Method: Trial Pitting	**Client's Representative:** N/A		Sheet 1 of 1 Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 195.20 mOD	**Date:** 30/10/2024	**Logger:** RS	FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			195.00	0.20		TOPSOIL:	
						Firm light brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular fine to medium. Cobbles are angular.	
0.50	B1						
0.50		HVP=117, HVR=15	194.60	0.60			
0.50		HVP=141, HVR=30				Stiff brown slightly gravelly sandy CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is angular fine to medium. Cobbles and boulders are subangular up to 550mm in diameter.	
0.50		HVP=64, HVR=18					
1.00		HVP=102, HVR=12					
1.00		HVP=141, HVR=21					
1.00		HVP=210, HVR=23					
1.50	B2						
2.50	B3						
		Slow seepage					▼
3.50	B4						
			191.20	4.00		End of trial pit at 4.00m	

Water Strikes	
Struck at (m)	Remarks
2.60	Slow seepage

Depth: 4.00
Width: 1.00
Length: 5.00

Remarks:

Stability: Stable

Termination Reason: Terminated at scheduled depth.

Last Updated: 30/04/2025

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CAUSEWAY GEOTECH

Project No. 24-1014	**Project Name:** Ballyfasy Wind Farm		**Trial Pit ID** TP13
Coordinates 662308.41 E 625943.31 N	**Client:** Tobin		
Method: Trial Pitting	**Client's Representative:** N/A		Sheet 1 of 1 Scale: 1:25
Plant: 13t Tracked Excavator	**Elevation** 194.26 mOD	**Date:** 29/10/2024	**Logger:** RS	FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			194.06	0.20		TOPSOIL:	
0.50	B1					Orangish brown sandy very clayey subangular fine to coarse GRAVEL. Sand is fine to coarse.	
			193.66	0.60		Grey sandy very clayey very angular fine to coarse GRAVEL with high cobble content. Sand is fine to coarse. Cobbles are angular.	
1.00	B2						
			192.96	1.30		End of trial pit at 1.30m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 1.30
Width: 1.00
Length: 4.00

Remarks:
Hand vane not possible. No groundwater encountered.

Stability:
Moderately stable

Termination Reason
Terminated at refusal on boulder / possible bedrock.

Last Updated
30/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
24-1014	Ballyfasy Wind Farm	TP14
Coordinates	**Client:** Tobin	
662432.31 E 626443.15 N	**Client's Representative:** N/A	Sheet 1 of 1 Scale: 1:25
Elevation 165.72 mOD	**Date:** 29/10/2024	**Logger:** RS

Method: Trial Pitting

Plant: 13t Tracked Excavator

FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			165.52	0.20		TOPSOIL:	
0.50	B1					Firm yellowish brown and grey mottled slightly sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is subangular fine to coarse.	
			165.12	0.60		Firm brown slightly gravelly sandy CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular.	
1.50	B2						
2.50	B3						
3.50	B4						
			161.72	4.00		End of trial pit at 4.00m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes

Struck at (m)	Remarks

Depth: 4.00
Width: 1.00
Length: 5.00

Remarks:
Hand vane not possible. No groundwater encountered.

Stability: Stable

Termination Reason
Terminated at scheduled depth.

Last Updated
30/04/2025

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CAUSEWAY GEOTECH

Project No.	Project Name:	Trial Pit ID
24-1014	Ballyfasy Wind Farm	TP15
Coordinates	**Client:** Tobin	
661326.35 E 625949.33 N	**Client's Representative:** N/A	Sheet 1 of 1 Scale: 1:25
Method: Trial Pitting		
Plant: 13t Tracked Excavator	**Elevation** 194.73 mOD	**Date:** 30/10/2024 **Logger:** RS — FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			194.53	0.20		TOPSOIL:	
0.50	B1		194.13	0.60		Soft brownish grey slightly sandy slightly gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular.	
1.00	B2		193.43	1.30		Firm pinkish brown slightly sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is subangular fine to coarse.	
2.00	B3	Slow flow	192.73	2.00		Firm yellow slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse.	▼
3.00	B4					Yellow sandy angular fine to coarse GRAVEL with high cobble content. Sand is fine to coarse. Cobbles are angular.	
4.00	B5		190.73	4.00		End of trial pit at 4.00m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks
1.90	Slow flow

Depth: 4.00
Width: 1.00
Length: 5.00

Remarks:
Hand vane not possible.

Stability: Moderately stable

Termination Reason: Terminated at scheduled depth.

Last Updated: 30/04/2025

AGS

APPENDIX F – TRIAL PIT PHOTOGRAPHS

TP01

CAUSEWAY GEOTECH

TP01

CAUSEWAY GEOTECH

TP01

TP06

CAUSEWAY GEOTECH

TP06

CAUSEWAY GEOTECH

TP06

CAUSEWAY GEOTECH

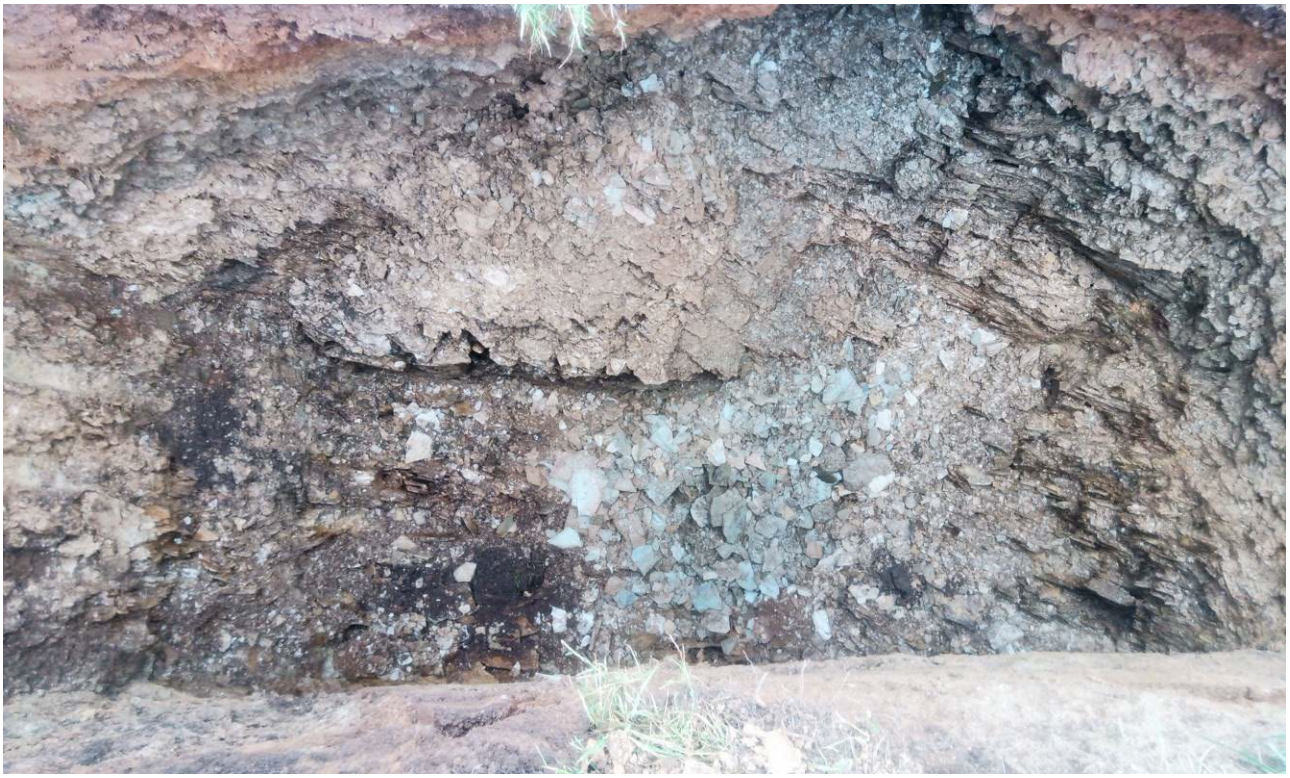
TP06

CAUSEWAY GEOTECH

TP07

TP07

CAUSEWAY GEOTECH



TP07

TP08

CAUSEWAY GEOTECH

TP08

CAUSEWAY GEOTECH

TP08

TP08

CAUSEWAY GEOTECH

TP09

TP09

TP09

CAUSEWAY GEOTECH

TP10

TP10

CAUSEWAY GEOTECH

TP10

CAUSEWAY GEOTECH

TP10

CAUSEWAY GEOTECH

TP11

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TP15

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TP15

CAUSEWAY GEOTECH

TP15

CAUSEWAY GEOTECH

TP15

TP15

CAUSEWAY GEOTECH

APPENDIX G – GEOTECHNICAL LABORATORY TEST RESULTS

CAUSEWAY GEOTECH LTD
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+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

15 February 2025

PROJECT NAME	Ballyfasy Windfarm
PROJECT NUMBER	24-1014
CLIENT	Tobin
ENGINEER	N/A

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 28/01/2025 and 15/02/2025.

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

CAUSEWAY GEOTECH LTD
8 Drumahiskey Road, Ballymoney
Co. Antrim, Northern Ireland, BT53 7QL

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

PROJECT NAME: Ballyfasy Windfarm

REPORT REFERENCE: Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Water Content of Soil	*BS 1377-2: 2022: Cl 4*	16
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	*BS 1377-2: 2022: Cl 5.3*	8
SOIL	Particle size distribution - wet sieving	*BS 1377-2: 2022: Cl 10*	9
SOIL	Particle size distribution - sedimentation hydrometer method	*BS 1377-2: 2022: Cl 10*	6
SOIL	Dry density/moisture content relationship (2.5 kg rammer)	*BS 1377-2: 2022: Cl 11.3*	1

SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Derwentside Environmental Testing Services Limited *(UKAS 2139)*	pH Value of Soil	*Documented In-House Method No DETSC 2008 based on BS 1377: Part 3:1990*	5

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
24-1014	Ballyfasy Wind Farm

Hole No.	Sample				Specimen Description	Density bulk / dry Mg/m3		*w* %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type										
TP10	1	0.50		B	Brown sandy slightly gravelly silty CLAY.			18.3						
TP10	2	1.50		B	Brown sandy slightly gravelly silty CLAY.			14.5	65	28 -1pt	17	11		CL
TP11	2	1.50		B	Brown sandy slightly gravelly silty CLAY.			12.4	60	26 -1pt	17	9		CL
TP11	3	2.50		B	Brown sandy slightly gravelly silty CLAY.			16.2						
TP12	2	1.50		B	Brown sandy slightly gravelly silty CLAY.			13.2	55	28 -1pt	18	10		CL
TP12	3	2.50		B	Brown sandy slightly gravelly silty CLAY.			15.5						
TP13	1	0.50		B	Brown sandy slightly gravelly silty CLAY.			29.2						
TP13	2	1.00		B	Brown sandy slightly gravelly silty CLAY.			8.4						
TP14	1	0.50		B	Brown sandy slightly gravelly clayey SILT.			35.1	81	53 -1pt	34	19		MH
TP14	3	2.50		B	Brown sandy slightly gravelly silty CLAY.			16.2						
TP14	4	3.50		B	Brown sandy slightly gravelly silty CLAY.			10.9	69	28 -1pt	18	10		CL
TP15	1	0.50		B	Brown sandy slightly gravelly silty CLAY.			25.4						

All tests performed in accordance with BS1377-2:2022 unless specified otherwise

LAB 26R - Version 2

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed

15/02/2025

Approved By

Stephen Watson

UKAS TESTING

10122

CAUSEWAY GEOTECH

Summary of Classification Test Results

Project No.	Project Name
24-1014	Ballyfasy Wind Farm

Hole No.	Sample				Specimen Description	Density bulk	Density dry	*w*	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		Mg/m3		%	%	%	%	%	Mg/m3	
TP15	2	1.00		B	Brown sandy slightly gravelly silty CLAY.			11.2	42	24 -1pt	18	6		ML/CL
TP7	1	0.50		B	Brown sandy slightly gravelly silty CLAY.			19.5						
TP7	2	1.00		B	Brown sandy slightly gravelly silty CLAY.			11.2	29	37 -1pt	25	12		MI/CI
TP8	2	1.50		B	Brown sandy slightly gravelly clayey SILT.			7.8	22	38 -1pt	30	8		MI

All tests performed in accordance with BS1377-2:2022 unless specified otherwise

LAB 26R - Version 2

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed

15/02/2025

Approved By

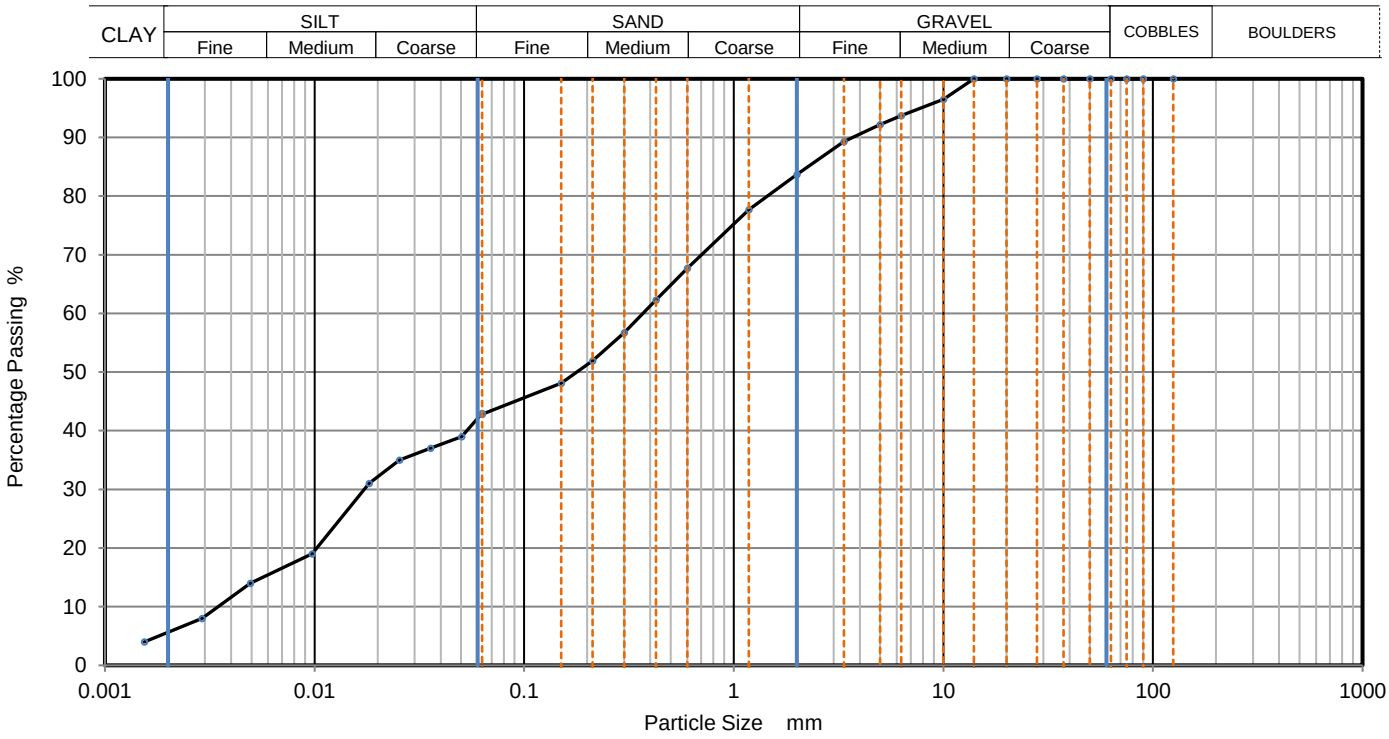
Stephen Watson

UKAS TESTING

10122

PARTICLE SIZE DISTRIBUTION

Job Ref					**24-1014**
Borehole/Pit No.					TP10
Site Name	Ballyfasy Wind Farm			Sample No.	2
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.50
				Sample Depth (m) Base	
Specimen Reference	7	Specimen Depth	1.5 m	Sample Type	B
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus2024121913



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	43
90	100	0.05028	39
75	100	0.03577	37
63	100	0.02545	35
50	100	0.01821	31
37.5	100	0.00973	19
28	100	0.00495	14
20	100	0.00290	8
14	100	0.00154	4
10	97		
6.3	94		
5	92		
3.35	89		
2	84		
1.18	78		
0.6	68	Particle density	(assumed)
0.425	62	2.65	Mg/m3
0.3	57		
0.212	52		
0.15	48		
0.063	43		

Dry Mass of sample, g: 360

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	16.3
Sand	40.9
Silt	37.3
Clay	5.5

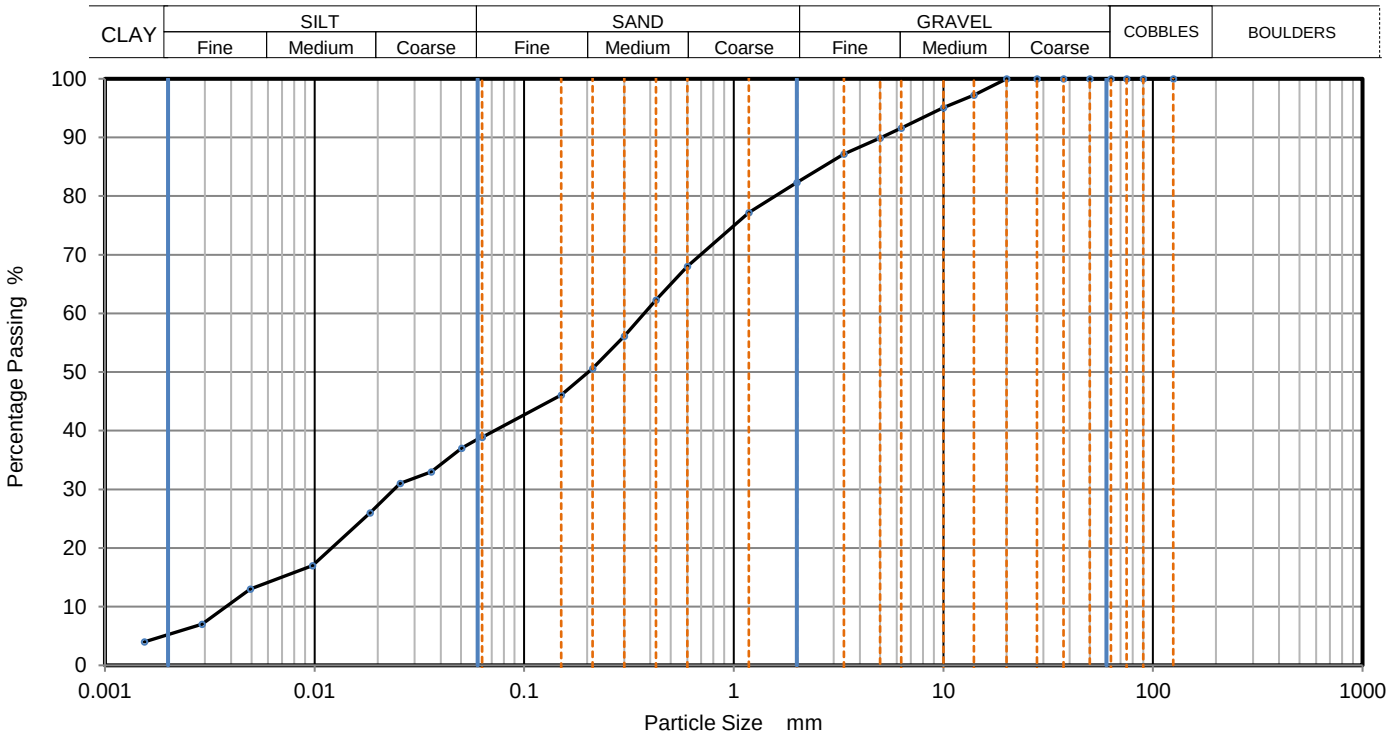
Grading Analysis		
D100	mm	
D60	mm	0.369
D30	mm	0.0171
D10	mm	0.00355
Uniformity Coefficient		100
Curvature Coefficient		0.22

Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**24-1014**
				Borehole/Pit No.	TP11
Site Name	Ballyfasy Wind Farm			Sample No.	2
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	1.50
				Sample Depth (m) Base	
Specimen Reference	9	Specimen Depth	1.5 m	Sample Type	B
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus2024121914



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	39
90	100	0.05028	37
75	100	0.03599	33
63	100	0.02560	31
50	100	0.01843	26
37.5	100	0.00979	17
28	100	0.00495	13
20	100	0.00290	7
14	97	0.00154	4
10	95		
6.3	92		
5	90		
3.35	87		
2	82		
1.18	77		
0.6	68	Particle density	(assumed)
0.425	62	2.65	Mg/m3
0.3	56		
0.212	51		
0.15	46		
0.063	39		

Dry Mass of sample, g: 428

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	17.7
Sand	43.3
Silt	33.8
Clay	5.2

Grading Analysis		
D100	mm	
D60	mm	0.373
D30	mm	0.0234
D10	mm	0.00372
Uniformity Coefficient		100
Curvature Coefficient		0.4

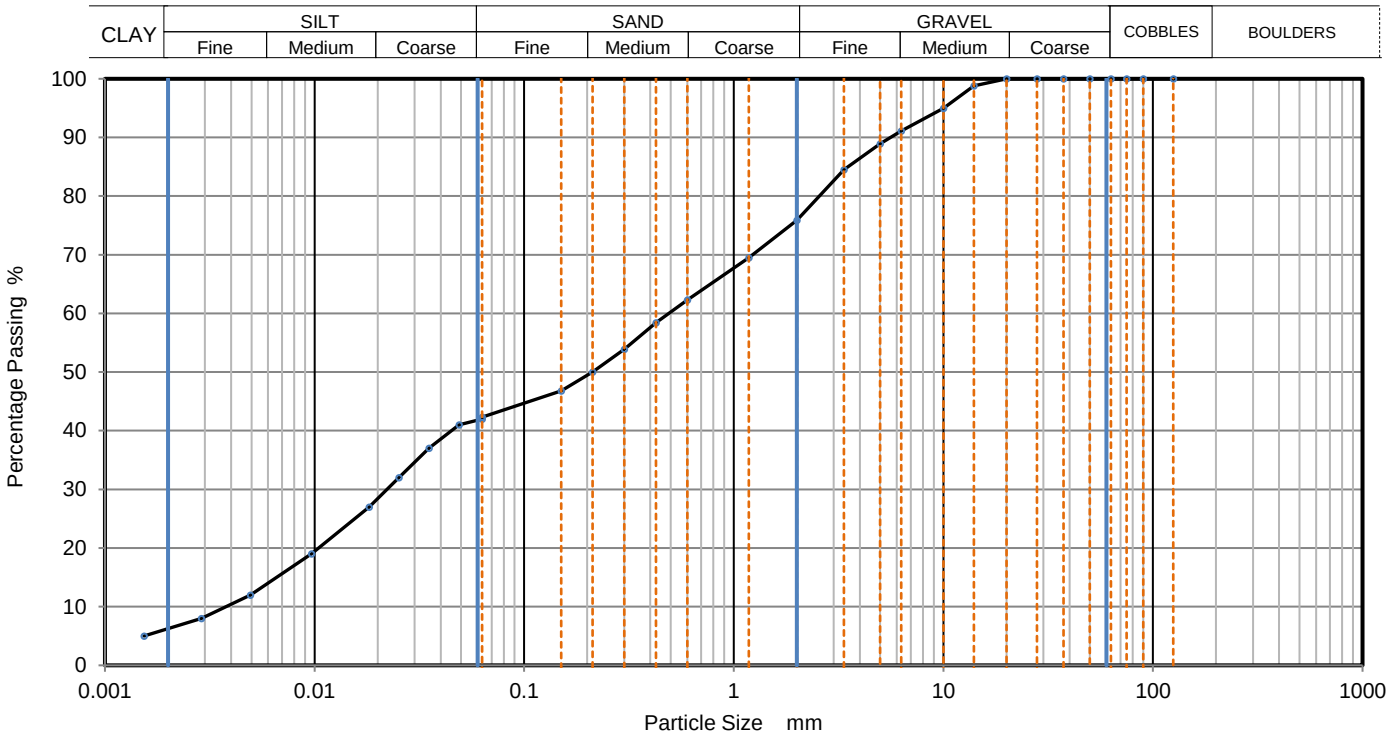
Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

				Job Ref	**24-1014**
				Borehole/Pit No.	TP12
Site Name	Ballyfasy Wind Farm			Sample No.	1
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	0.50
				Sample Depth (m) Base	
Specimen Reference	3	Specimen Depth	0.5 m	Sample Type	B
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus2024121916



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	42
90	100	0.04901	41
75	100	0.03510	37
63	100	0.02529	32
50	100	0.01821	27
37.5	100	0.00968	19
28	100	0.00495	12
20	100	0.00289	8
14	99	0.00153	5
10	95		
6.3	91		
5	89		
3.35	85		
2	76		
1.18	70		
0.6	62	Particle density	(assumed)
0.425	58	2.65	Mg/m3
0.3	54		
0.212	50		
0.15	47		
0.063	42		

Dry Mass of sample, g: 405

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	24.1
Sand	33.7
Silt	35.7
Clay	6.5

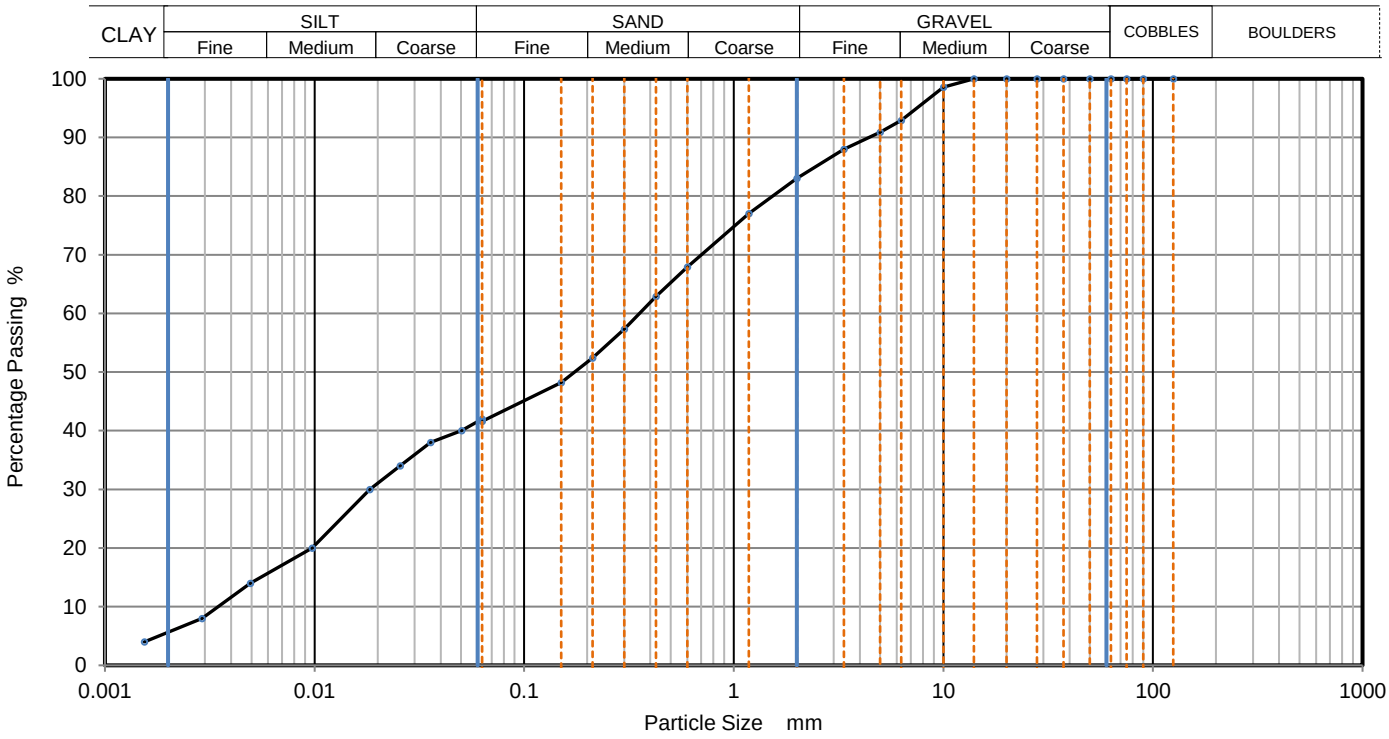
Grading Analysis		
D100	mm	
D60	mm	0.489
D30	mm	0.022
D10	mm	0.00369
Uniformity Coefficient		130
Curvature Coefficient		0.27

Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**24-1014**
				Borehole/Pit No.	TP12
Site Name	Ballyfasy Wind Farm			Sample No.	4
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	3.50
				Sample Depth (m) Base	
Specimen Reference	3	Specimen Depth	3.5 m	Sample Type	B
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus2024121919



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	42
90	100	0.05028	40
75	100	0.03577	38
63	100	0.02560	34
50	100	0.01832	30
37.5	100	0.00973	20
28	100	0.00495	14
20	100	0.00290	8
14	100	0.00154	4
10	99		
6.3	93		
5	91		
3.35	88		
2	83		
1.18	77		
0.6	68	Particle density	(assumed)
0.425	63	2.65	Mg/m3
0.3	57		
0.212	52		
0.15	48		
0.063	42		

Dry Mass of sample, g: 403

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	17.0
Sand	41.4
Silt	36.0
Clay	5.6

Grading Analysis		
D100	mm	
D60	mm	0.355
D30	mm	0.0188
D10	mm	0.0035
Uniformity Coefficient		100
Curvature Coefficient		0.28

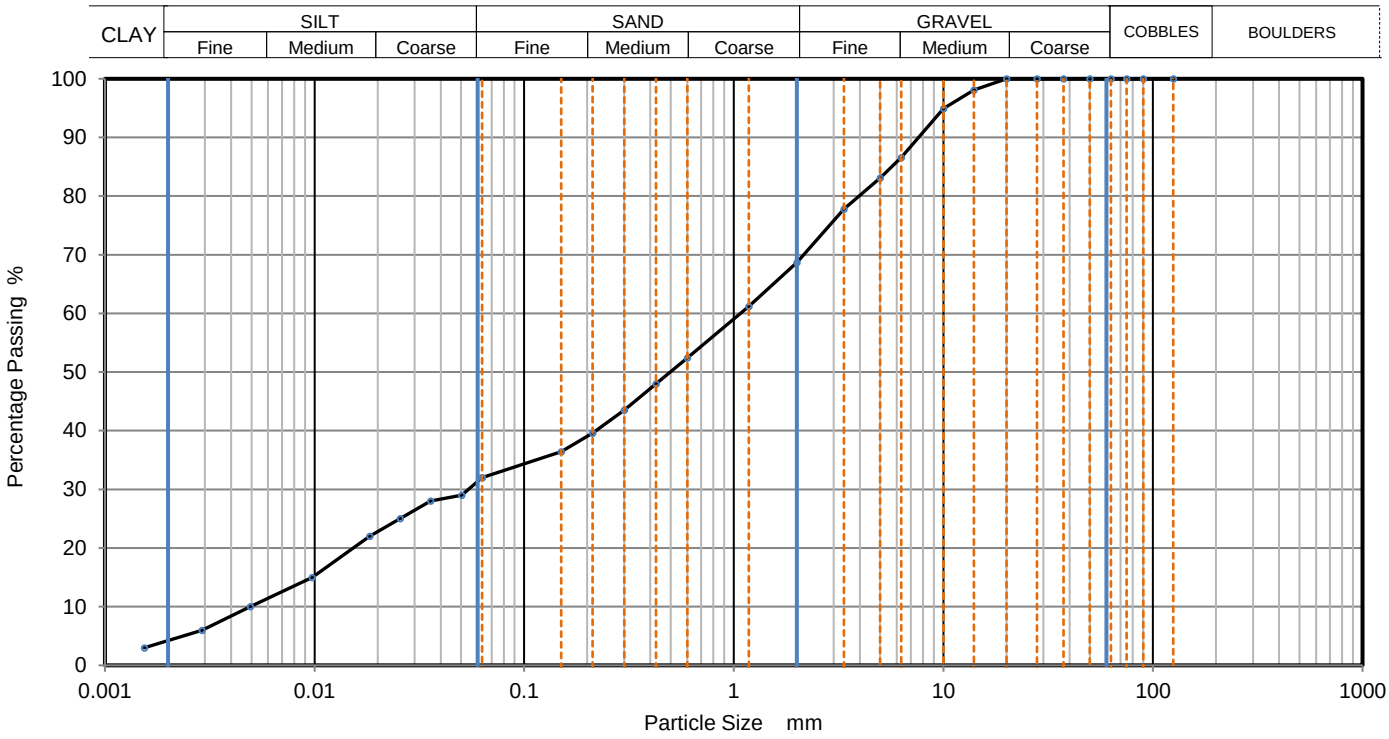
Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

UKAS TESTING

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		24-1014
					Borehole/Pit No.		TP14
Site Name	Ballyfasy Wind Farm				Sample No.		2
Specimen Description	Brown sandy slightly gravelly silty CLAY.				Sample Depth (m)	Top	1.50
						Base	
Specimen Reference	4	Specimen Depth	1.5	m	Sample Type		B
Test Method	BS1377-2:2022 Clause 10				KeyLAB ID		Caus2024121923



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	32
90	100	0.05028	29
75	100	0.03577	28
63	100	0.02560	25
50	100	0.01832	22
37.5	100	0.00973	15
28	100	0.00495	10
20	100	0.00290	6
14	98	0.00154	3
10	95		
6.3	87		
5	83		
3.35	78		
2	69		
1.18	61		
0.6	52	Particle density	(assumed)
0.425	48	2.65	Mg/m3
0.3	44		
0.212	40		
0.15	36		
0.063	32		

Dry Mass of sample, g: 406

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	31.3
Sand	36.7
Silt	27.9
Clay	4.1

Grading Analysis		
D100	mm	
D60	mm	1.07
D30	mm	0.054
D10	mm	0.00484
Uniformity Coefficient		220
Curvature Coefficient		0.56

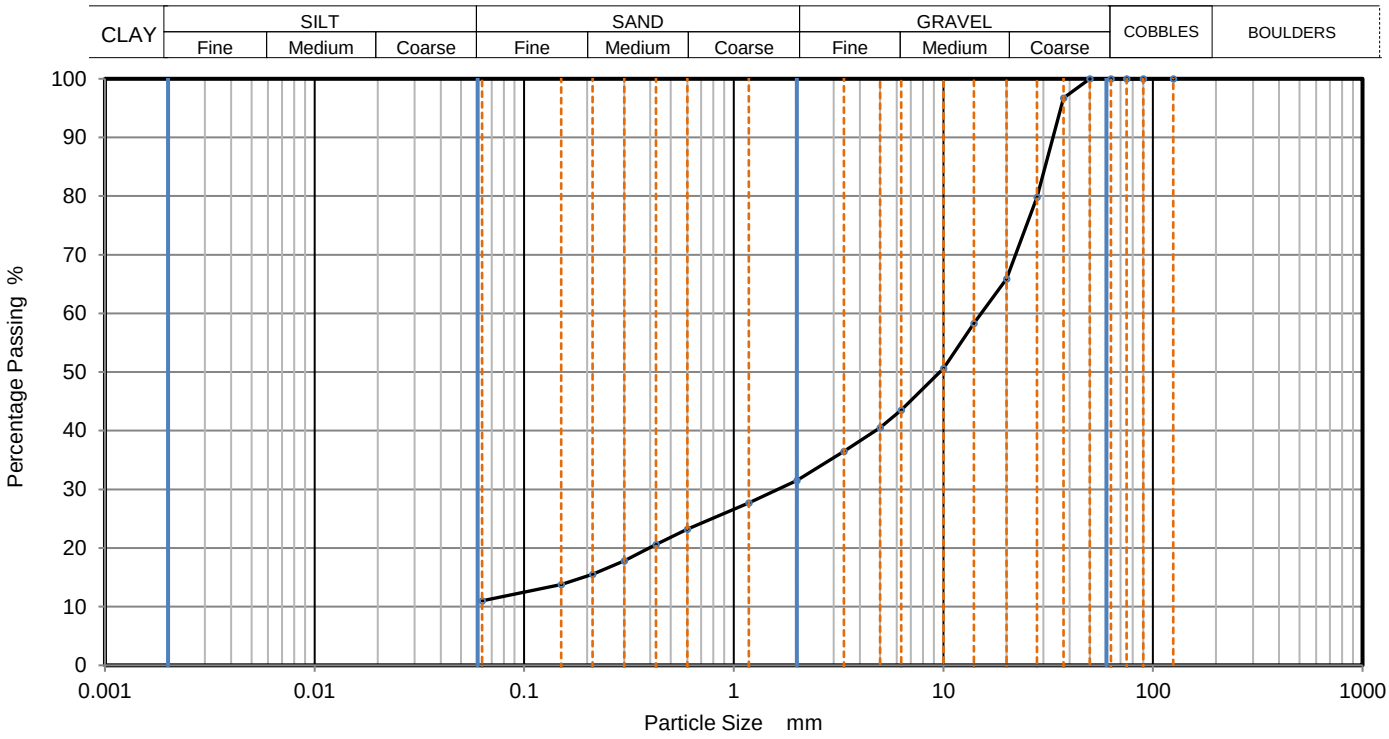
Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

Job Ref					**24-1014**
Borehole/Pit No.					TP15
Site Name	Ballyfasy Wind Farm			Sample No.	3
Specimen Description	Brown gravelly clayey fine to coarse SAND.			Sample Depth (m) Top	2.00
				Base	
Specimen Reference	3	Specimen Depth	2 m	Sample Type	B
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus2024121928



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	97		
28	80		
20	66		
14	58		
10	51		
6.3	44		
5	41		
3.35	37		
2	32		
1.18	28		
0.6	23		
0.425	21		
0.3	18		
0.212	16		
0.15	14		
0.063	11		

Dry Mass of sample, g: 3506

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	68.5
Sand	20.4
Fines <0.063mm	11.0

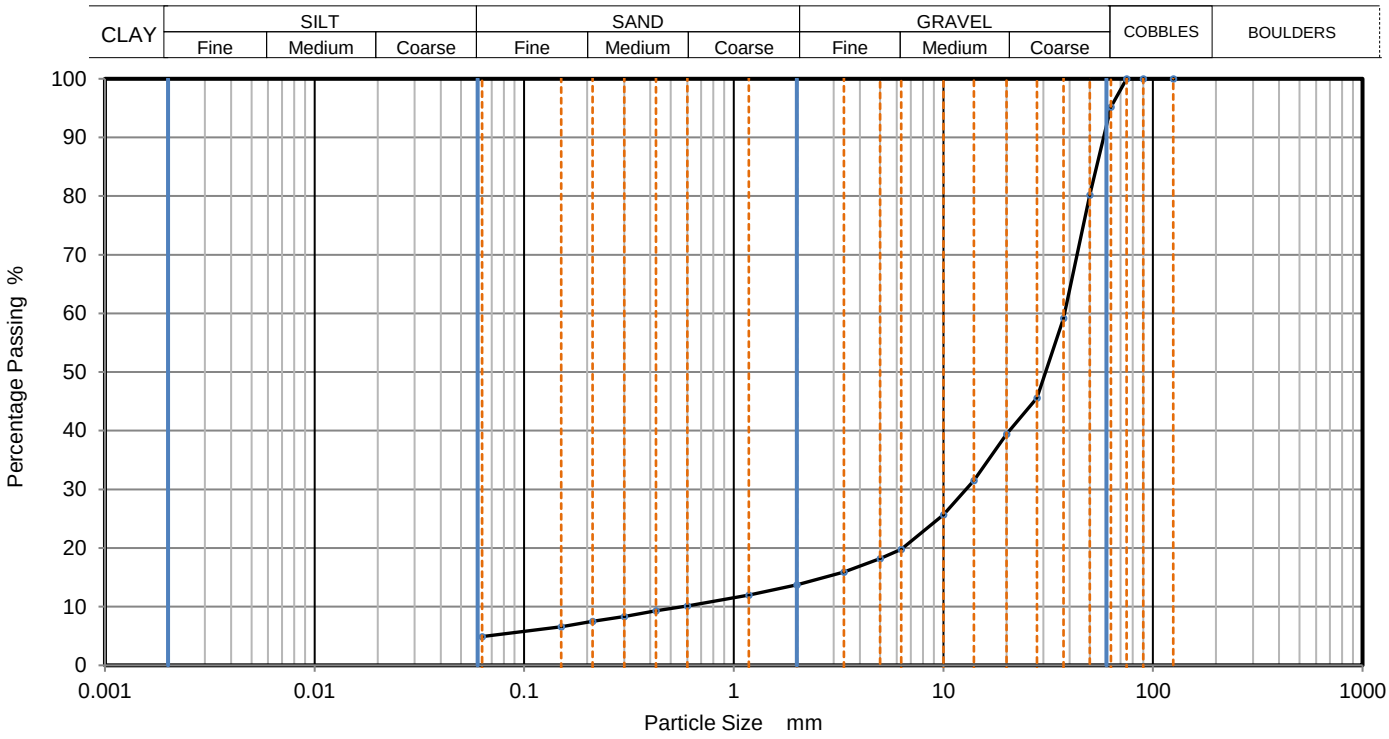
Grading Analysis		
D100	mm	
D60	mm	15.2
D30	mm	1.62
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION				Job Ref		24-1014
					Borehole/Pit No.		TP15
Site Name	Ballyfasy Wind Farm				Sample No.		5
Specimen Description	Brown slightly sandy slightly clayey subangular fine to coarse GRAVEL.				Sample Depth (m)	Top	4.00
						Base	
Specimen Reference	3	Specimen Depth	4	m	Sample Type		B
Test Method	BS1377-2:2022 Clause 10				KeyLAB ID		Caus2024121929



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	95		
50	80		
37.5	59		
28	46		
20	39		
14	32		
10	26		
6.3	20		
5	18		
3.35	16		
2	14		
1.18	12		
0.6	10		
0.425	9		
0.3	8		
0.212	8		
0.15	7		
0.063	5		

Dry Mass of sample, g	6308

Sample Proportions	% dry mass
Cobbles	4.8
Gravel	81.5
Sand	8.7
Fines <0.063mm	5.0

Grading Analysis		
D100	mm	
D60	mm	37.9
D30	mm	12.8
D10	mm	0.569
Uniformity Coefficient		67
Curvature Coefficient		7.6

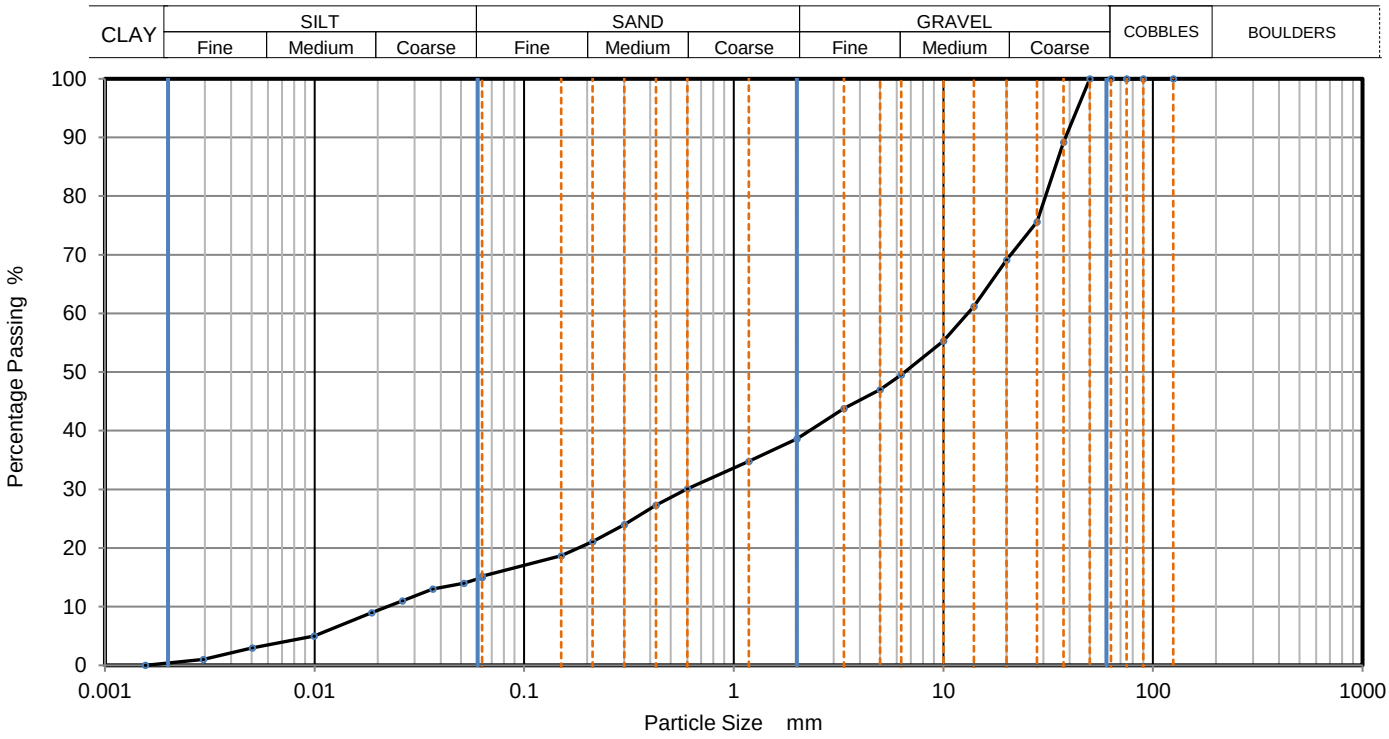
Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

				Job Ref	**24-1014**
				Borehole/Pit No.	TP8
Site Name	Ballyfasy Wind Farm			Sample No.	1
Specimen Description	Brown sandy gravelly silty CLAY.			Sample Depth (m) Top	0.50
				Sample Depth (m) Base	
Specimen Reference	3	Specimen Depth	0.5 m	Sample Type	B
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus2024121932



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	15
90	100	0.05151	14
75	100	0.03664	13
63	100	0.02621	11
50	100	0.01874	9
37.5	89	0.00995	5
28	76	0.00505	3
20	69	0.00295	1
14	61	0.00156	0
10	55		
6.3	50		
5	47		
3.35	44		
2	39		
1.18	35		
0.6	30	Particle density	(assumed)
0.425	27	2.65	Mg/m3
0.3	24		
0.212	21		
0.15	19		
0.063	15		

Dry Mass of sample, g: 3789

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	61.4
Sand	23.4
Silt	14.9
Clay	0.3

Grading Analysis		
D100	mm	
D60	mm	13
D30	mm	0.592
D10	mm	0.0216
Uniformity Coefficient		600
Curvature Coefficient		1.2

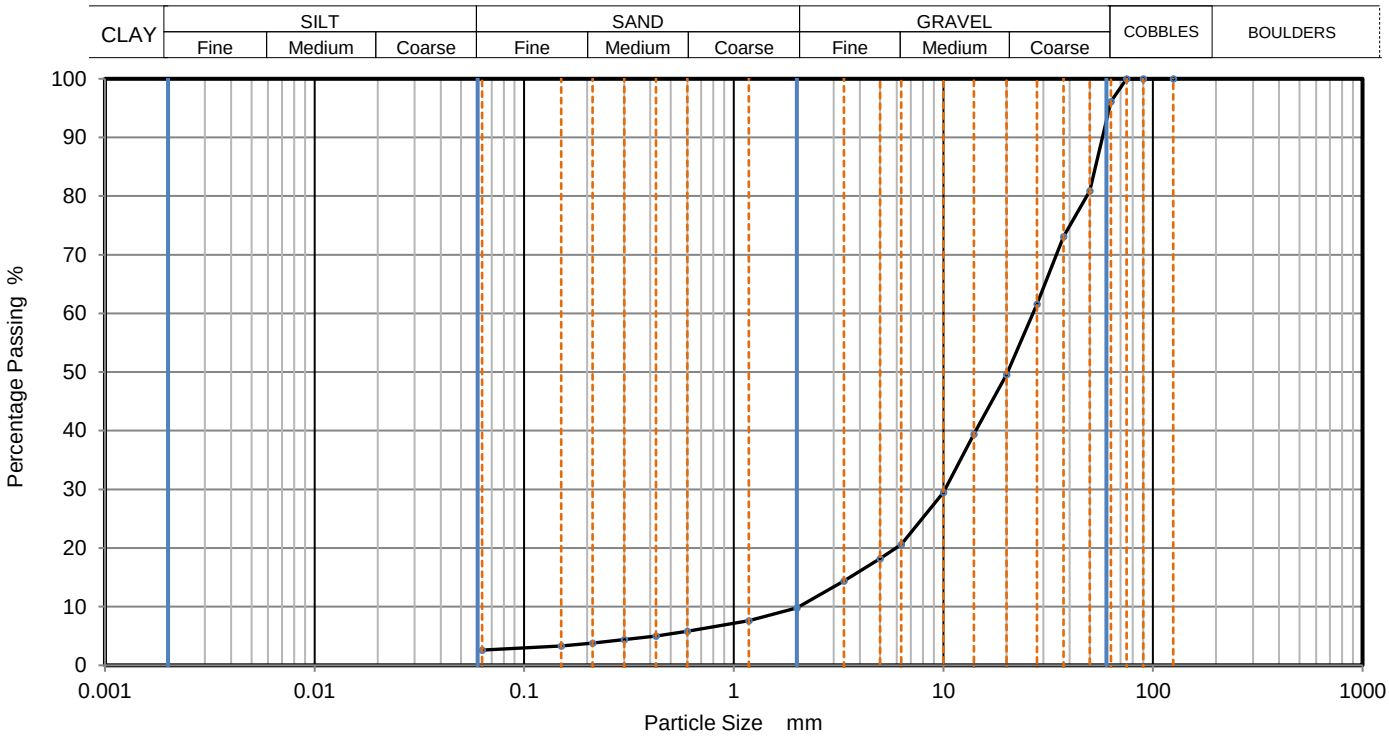
Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

PARTICLE SIZE DISTRIBUTION

				Job Ref	**24-1014**
				Borehole/Pit No.	TP8
Site Name	Ballyfasy Wind Farm			Sample No.	3
Specimen Description	Brown slightly sandy slightly clayey subangular fine to coarse GRAVEL.			Sample Depth (m) Top	2.50
				Sample Depth (m) Base	
Specimen Reference	3	Specimen Depth	2.5 m	Sample Type	B
Test Method	BS1377-2:2022 Clause 10			KeyLAB ID	Caus2024121934



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	96		
50	81		
37.5	73		
28	62		
20	50		
14	39		
10	30		
6.3	21		
5	18		
3.35	14		
2	10		
1.18	8		
0.6	6		
0.425	5		
0.3	4		
0.212	4		
0.15	3		
0.063	3		

Dry Mass of sample, g	4965

Sample Proportions	% dry mass
Cobbles	3.9
Gravel	86.2
Sand	7.2
Fines <0.063mm	3.0

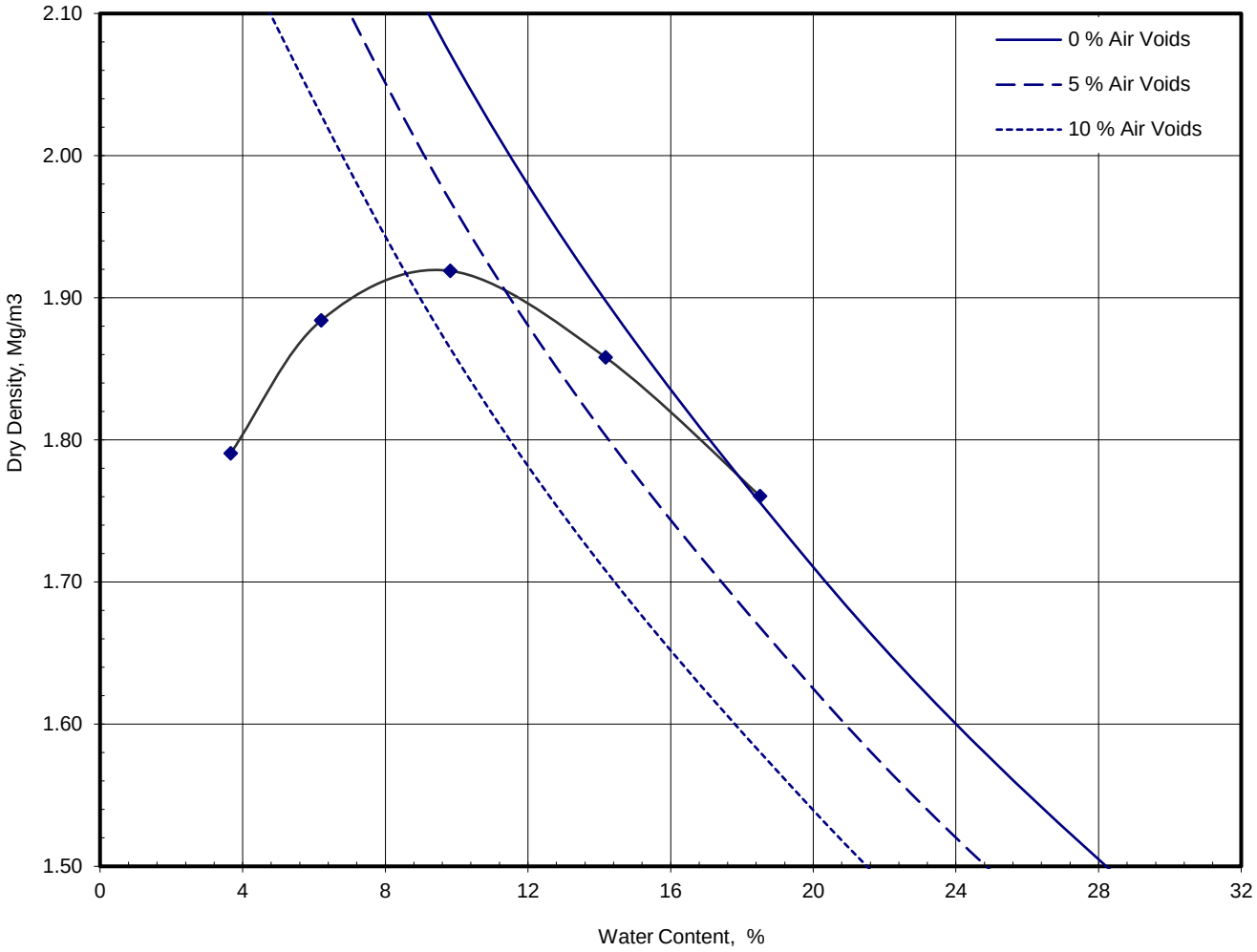
Grading Analysis		
D100	mm	
D60	mm	26.8
D30	mm	10.2
D10	mm	2.04
Uniformity Coefficient		13
Curvature Coefficient		1.9

Remarks

Preparation and testing in accordance with ISO 17892-4:2016

Approved
Stephen Watson

CAUSEWAY GEOTECH	**Dry Density / Moisture Content Relationship Light Compaction**			Job Ref	**24-1014**
				Borehole / Pit No	TP14
Site Name	**Ballyfasy Wind Farm**			Sample No	3
Specimen Description	Brown sandy slightly gravelly silty CLAY.			Sample Depth (m) Top	2.50
				Sample Depth (m) Base	
Specimen Ref.	6	Specimen Depth	m	Sample Type	B
Test Method	BS1377-2: 2022, clause 11.3, 2.5kg rammer			Keylab ID	Caus2024121924



Preparation		Material used was air dried
Mould Type		1 LITRE
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	3
Particle Density - Assumed	Mg/m³	2.60

Maximum Dry Density	Mg/m³	**1.92**
Optimum Water Content	%	**9.8**

Approved	Remarks	UKAS TESTING 10122
Stephen Watson	LAB 33R - Version 1	

Certificate of Analysis

Certificate Number 25-02306 *Issued:* 05-Feb-25

Client Causeway Geotech
8 Drumahiskey Road
Ballymoney
County Antrim
BT53 7QL

Our Reference 25-02306

Client Reference ~ 24-1014

Order No ~ (not supplied)

Contract Title ~ Ballyfasy Wind Farm

Description 5 Soil samples.

Date Received 03-Feb-25

Date Started 03-Feb-25

Date Completed 05-Feb-25

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Geddes
Laboratory Manager

2139

Normec Dets Limited
Unit 2, Park Road Industrial Estate South, Consett, Co Durham, DH8 5PY
Tel: 01207 582333 • email: info-dets@normecgroup.com • normecdets.com/

Summary of Chemical Analysis
Soil Samples

Our Ref 25-02306
Client Ref ~ 24-1014
Contract Title ~ Ballyfasy Wind Farm

			Lab No	2458290	2458291	2458292	2458293	2458294
			Sample ID ~	TP10	TP12	TP12	TP14	TP15
			Depth ~	1.50	0.50	3.50	1.50	1.00
			Other ID ~	2	1	4	2	2
			Sample Type ~	B	B	B	B	B
			Sampling Date ~	31/01/2025	31/01/2025	31/01/2025	31/01/2025	31/01/2025
			Sampling Time ~	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
Inorganics								
pH	DETSC 2008#		pH	6.8	7.0	6.1	7.0	5.9

Information in Support of the Analytical Results

Our Ref 25-02306
Client Ref ~ 24-1014
Contract ~ Ballyfasy Wind Farm

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2458290	TP10 1.50 SOIL	31/01/25	PT 500ml		
2458291	TP12 0.50 SOIL	31/01/25	PT 500ml		
2458292	TP12 3.50 SOIL	31/01/25	PT 500ml		
2458293	TP14 1.50 SOIL	31/01/25	PT 500ml		
2458294	TP15 1.00 SOIL	31/01/25	PT 500ml		

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Key:

~ Sample details are provided by the client and can affect the validity of the results
***** -not accredited.
# -MCERTS (accreditation only applies if report carries the MCERTS logo).
$ -subcontracted.
n/s -not supplied.
I/S -insufficient sample.
U/S -unsuitable sample.
t/f -to follow.
nd -not detected.

End of Report

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www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

1 April 2025

PROJECT NAME	Ballyfasy Windfarm
PROJECT NUMBER	24-1014
CLIENT	Tobin
ENGINEER	N/A

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s). This testing was performed between 25/03/2025 and 01/04/2025.

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

CAUSEWAY GEOTECH

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www.causewaygeotech.com

PROJECT NAME: Ballyfasy Windfarm

REPORT REFERENCE: Schedule 2

The table below details the tests carried out, the specifications used, and the number of tests included in this report. Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests.

The results contained in this report relate to the sample(s) as received. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. This report shall not be reproduced other than in full, without the prior written approval of the laboratory.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	*ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985*	2

SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

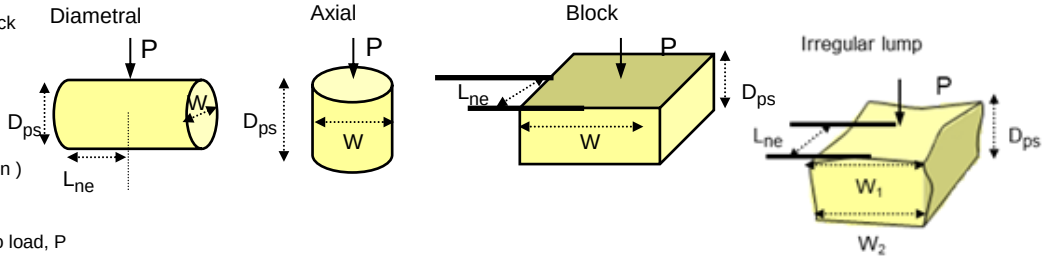
Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK – subcontracted to MATtest Limited *(UKAS 2643)*	Slake Durability Index	*ISRM Suggested Methods – Rock Characterization Testing and Monitoring. Ed. ET Brown – 1981*	1

Point Load Strength Index Tests
Summary of Results

Project No.	Project Name
24-1014	Ballyfasy Wind Farm

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
BH01	3.00	1	C	1	3.00	SHALE	D	U	YES	72.3	101.3	101.3	99.0	0.6	100.1	0.1	0.1	
BH01	6.00	2	C	1	6.00	SHALE	A	U	NO		101.3	98.0	90.0	1.0	107.7	0.1	0.1	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 1985, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R - Version 5

Date Printed: 04/01/2025 00:00

Approved By: Stephen Watson

UKAS TESTING
10122

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org
Website: www.mattest.org

Certificate No : **25/369 - 01-1**

To : **Stephen Watson**

Client : **Causeway Geotech Limited**
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

SLAKE DURABILITY INDEX (SECOND CYCLE)
ISRM (2007)

Introduction

We refer to a sample taken from Ballyfasy Windfarm and delivered to our laboratory on 28th March 2025.

Material & Source

Sample Reference	:	BH01, C, 4.00m
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	BH01, C, 4.00m
Designation (d/D)	:	Not Supplied
Description	:	Crushed Rock
Date Sampled	:	Not Supplied
Date Tested	:	28th March 2025 Onwards
Source	:	24-1014 - Ballyfasy Windfarm
Slaking Fluid	:	Water
Fluid Temperature (^{o}C)	:	20 ± 2

Test Results

APPEARANCE OF FRAGMENTS RETAINED IN THE DRUM
Retained pieces remain virtually unchanged

APPEARANCE OF MATERIAL PASSING THROUGH THE DRUM
Passing material ranges from fine to coarse sand sized particles

SLAKE DURABILITY INDEX (%) **95.0**

Comments

The results contained in this test certificate relate to the sample(s) as received
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This test certificate should not be reproduced without the written approval of the laboratory
All remaining samples for this project will be disposed of 28 days after issue of this test certificate

Remarks

Approved for Issue

T McLelland (Director)

Date 01/04/2025

UKAS TESTING
2643

CAUSEWAY GEOTECH

Causeway Geotech Limited has made its commitment to health and safety of people, the environment and the quality of its services an integral part of our strategy.

Whether it be ensuring people's safety or meeting the challenges of operating in an ecologically diverse environment, we aim to act in a sustainable and responsible manner at all times.

CERTIFICATIONS /ACCREDITATIONS

Constructionline Gold Member

SCS INTEGRATED CERTIFICATION ISO 9001, 14001 & 45001 — UKAS MANAGEMENT SYSTEMS 9235

MEMBERSHIPS

AGS

BRITISH DRILLING ASSOCIATION

BGA · THE BRITISH · GEOTECHNICAL ASSOCIATION

INTERNATIONAL JACK-UP BARGE OPERATORS ASSOCIATION

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