



ElAR Volume 6: Onshore Infrastructure Technical Appendices Appendix 6.5.3-3: Cable Route Ground Investigation

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THIRD PARTY COVERSHEET

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CAUSEWAY
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Dublin Array Onshore Cable Route Ground Investigation

Client: Dublin Array

Client's Representative: Gavin & Doherty Geosolutions (GDG)

Report No.: 23-0343

Date: February 2024

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Document Control Sheet

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Document Control Sheet

Report No.:		23-0343			
Project Title:		Dublin Array Onshore Cable Route			
Client:		Dublin Array			
Client's Representative:		Gavin & Doherty Geosolutions (GDG)			
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The works were conducted in accordance with:

UK Specification for Ground Investigation 2nd Edition, published by ICE Publishing (2012)

British Standards Institute (2015) BS 5930:2015+A1:2020, Code of practice for ground investigations.

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

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9

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	In situ hand vane test result (HVP) and vane test residual result (HVR). Results presented in kPa.
V	Shear vane test (borehole). Shear strength stated in kPa.
VR	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 $N \times 5 = C_u$ 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.

Dublin Array Onshore Cable Route

1 AUTHORITY

On the instructions of Gavin & Doherty Geosolutions, ("the Client's Representative"), acting on the behalf of Dublin Array ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of onshore elements for a proposed offshore windfarm.

This report details the work carried out both on site and in the geotechnical and chemical 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 and the Client's Representative 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 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included boreholes, trial pits, slit trenches, soil and rock core sampling, environmental sampling, groundwater monitoring, in-situ and laboratory testing, and the preparation of a factual report on the findings.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted across various sites along the proposed cable route from the proposed sub-station at the most western extent, located west of Carrickmines Retail Park, adjacent to Ballyogan Landfill, to the proposed landfall site at the most eastern extent, located at Shanganagh Allotments, south of Shanganah/Bray Wastewater Treatment Plant.

Works were completed within grass areas of council parks and private property.

4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 11th September and 15th November 2023, comprised:

- fifteen boreholes
 - three light cable percussion boreholes (2 of which were inspection pits only)
 - ten boreholes by light cable percussive extended by rotary follow-on drilling methods
 - two boreholes by rotary drilling methods only
- a standpipe installation in one borehole
- fifteen machine dug trial pits/slit trenches; and
- GPR surveys

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

4.2 Boreholes

A total of fifteen boreholes were put down in a minimum diameter of 150mm through soils and rock strata to their completion depths by a combination of methods, including light cable percussion boring by a Dando 2000 rig and rotary drilling by a Comacchio 405 tracked rotary drilling rig.

The borehole logs state the methodology and plant used for each location, as well as the appropriate depth ranges.

A summary of the boreholes, subdivided by category in accordance with the methods employed for their completion, is presented in the following sub-sections.

4.2.1 Light cable percussion boreholes

Three boreholes, as listed in Table 1 below, were put down to completion in minimum 200mm diameter using a Dando 2000 light cable percussion boring rig. All boreholes were terminated on encountering virtual refusal on obstructions, including large boulders and weathered bedrock.

Table 1 Summary of cable percussion boreholes completed

GI Ref	Type	Depth (mbgl)
WP03_BH11A	CP (Inspection pit only)	0.30
WP03_BH11B	CP (Inspection pit only)	0.80
WP03_BH14A	CP	2.80

Hand dug inspection pits were carried out between ground level and depths up to 1.20m to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Disturbed (bulk and small bag) samples were taken within the encountered strata. Environmental samples were taken at standard intervals, as directed by the Client's Representative.

Standard penetration tests were carried out in accordance with BS EN 22476-3:2005+A1:2011 at standard depth intervals using the split spoon sampler (SPT_(s)) or solid cone attachment (SPT_(c)). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix H.

Any water strikes encountered during boring were recorded along with any changes in their levels as the borehole proceeded.

Where water was added to assist with boring, a note has been added to the log to account for same.

Appendix B presents the borehole logs.

4.2.2 Boreholes by combined percussion boring and rotary follow-on drilling

Ten boreholes as listed in Table 2 below, were put down to completion by a combination of light cable percussion boring using a Dando 2000 light cable percussion boring rig and rotary follow-on drilling techniques with core recovery in overburden and bedrock using a Comacchio 405 rotary drilling rig.

Table 2 Summary of cable percussion with rotary follow-on boreholes completed

GI Ref	Type	Depth (mbgl)
WP03_BH01	CP + RC	9.80
WP03_BH02	CP + RC	9.80
WP03_BH05	CP + RC	10
WP03_BH07	CP + RC	8
WP03_BH08	CP + RC	8
WP03_BH09	CP + RC	8
WP03_BH10	CP + RC	5.3
WP03_BH11	CP + RC	20.3
WP03_BH13	CP + RC	25
WP03_BH14	CP + RC	25

WP03_BH10 was terminated due to encountering a possible service at 5.30mbgl and re-drilled at the location of WP03_BH10A as a rotary only borehole.

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Disturbed (bulk and small bag) samples were taken within the encountered strata. Undisturbed (U100) samples were taken where appropriate and as directed within fine soils. Environmental samples were taken at standard intervals, as directed by the Client's Representative.

Standard penetration tests were carried out in accordance with BS EN 22476-3:2005+A1:2011 at standard depth intervals throughout the overburden using the split spoon sampler (SPT_(s)) or solid cone attachment (SPT_(c)). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix H.

Any water strikes encountered during boring were recorded along with any changes in their levels as the borehole proceeded.

Where water was added to assist with boring, a note has been added to the log to account for same.

Where granular material was encountered that was not suitable for coring, rotary percussive drilling techniques were employed to advance the borehole to scheduled depth. SPTs were carried out at standard intervals throughout these sections, with small and bulk disturbed samples obtained where possible through the soil strata.

Where coring was carried out from the base of the cable percussion borehole to recover core samples of overburden and/or bedrock, Geobor S Coring was used. The core was extracted in up to 1.5m lengths using an SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single 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.

4.2.3 Rotary drilled boreholes

Two boreholes as listed in Table 3 below, were put to their completion by rotary drilling techniques only using a Comacchio 405 rotary drilling rig.

Table 3 Summary of rotary only boreholes

GI Ref	Type	Depth (mbgl)
WP03_BH06	RC Only	21.80
WP03_BH10A	RC Only	20.30

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the casing system to achieve a sufficient flush seal, after which rotary coring was employed to recover core samples of the overburden and bedrock. SPTs were carried out at standard intervals throughout the overburden in accordance with BS EN 22476-3:2005+A1:2011 at standard depth intervals throughout the overburden using the split spoon sampler (SPT_(s)) or solid cone attachment (SPT_(c)). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix H.

Where coring was carried out within bedrock strata, Geobor S Coring was used. The core was extracted in up to 1.5m lengths using an SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single 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 Standpipe installations

A groundwater monitoring standpipe was installed in WP03_BH06.

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

4.4 Trial pit/Slit trenches

Fifteen trial pit/slit trenches, as listed below in Table 4, were excavated by a combination of hand digging and mechanical excavation using a compact 3t tracked excavator fitted with a 600mm wide toothless bucket, to investigate the extent of the existing landfill site.

Table 4 Summary of trial pit/slit trenches completed.

GI Ref	GI Ref
WP03_TP01	WP03_TP05
WP03_TP02	WP03_TP06
WP03_TP03	WP03_TP06A
WP03_TP04	WP03_TP07
WP03_TP04A	WP03_TP07A
WP03_TP04B	WP03_TP08
WP03_TP04C	WP03_TP08A
	WP03_TP09

Environmental samples were taken at depths of as indicated by the Client in specific pits/trenches.

Disturbed (small jar and bulk bag) samples were taken at standard depth intervals and at change of strata.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Drawing of the trenches and any elements of the landfill construction encountered during excavation are shown along with the slit trench logs in Appendix D, with photographs presented in Appendix E.

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.

4.6 Groundwater monitoring

Following completion of site works, a groundwater data logger was installed in WP03_BH06 to monitor groundwater levels over the course of 12 months. Ground water monitoring was carried out using a water interface probe.

Data from the logger will be downloaded and issued to the Client electronically at specified months throughout the year.

4.7 GPR Surveys

Several phases of GPR surveys were completed across the proposed cable route from March to November 2023, by Scantech Geoscience Ltd to identify location and type of any services present.

Results of the survey have been presented to the Client electronically and are not presented within this report.

5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described, and their descriptions incorporated into the borehole logs.

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.
- **thermal resistivity:** single point and five-point thermal resistivity tests

Laboratory testing of soils samples was carried out in accordance with British Standards Institute: *BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (2016), and Parts 2-9 (1990)*.

The test results are presented in Appendix F.

5.2 Geotechnical laboratory testing of rock

Laboratory testing of rock sub-samples comprised:

- point load index
- unconfined compressive strength (UCS) tests

- cherchar abrasivity testing

Table 5 Rock testing undertaken

Test	Test carried out in accordance with
Point load index	ISRM Suggested Methods (1985) Suggested method for determining point-load strength. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. 22, pp. 53–60
Uniaxial compression strength tests	ISRM Suggested Methods (1981) Suggested method for determining deformability of rock materials in uniaxial compression, Part 2 and ISRM (2007) Ulusay R, Hudson JA (eds) The complete ISRM suggested methods for rock characterization, testing and monitoring, 2007
Cherchar Abrasivity Index	ASTM D7625-10; Standard Test Method for Laboratory Determination of Abrasiveness of Rock Using the CERCHAR Method.

The test results are presented in Appendix F.

5.3 Environmental laboratory testing of soils

Environmental testing, as specified by the Client's Representative was conducted on selected soil samples by Derwentside Environmental Testing Services in Consett, Durham.

Testing was carried out according to suites set out by the Client's Representative:

- Soil Analysis Suite
- Leachate Analysis Suite
- Inert WAC

Results of environmental laboratory testing are presented in Appendix G.

6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise glacial till and alluvium. These deposits are underlain by Leinster Granite to the east and slates, phyllites and schists of the Maulin Formation to the east towards the coast.

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 across the site in either it's natural state or reworked state with a thickness range of 100-300mm.
- **Made Ground (sub-base):** aggregate fill was encountered within some of the slit trenches in the landfill site, generally surrounding services.
- **Made Ground (fill):** generally reworked sandy gravelly clay fill or gravelly clayey sand encountered to various extents across the site. Pieces of plastic were encountered within the strata in WP03_TP04A and WP03_TP08. Encountered greatest in extent in WP03_BH07, where the driller noted a hydrocarbon odour from the strata, WP03_BH10 adjacent to the M50 motorway likely built up during construction, and WP03_BH05, the location of an old construction compound.
- **Alluvium:** Medium dense to dense sand and gravel encountered adjacent to a stream in WP03_BH07 and WP03_BH08 to depth of 8.00mbgl.
- **Glacial Sands & Gravels:** Extensive sand and gravel deposits encountered in WP03_BH14 to a depth of 25.00mbgl.
- **Glacial Till:** sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth, often with lenses of dense granular material.
- **Bedrock (Granite):** Granite of various strengths was encountered across the site from 2.30m in WP03_BH02 to depths of 20.30m in WP03_BH06, with depth to bedrock generally increasing eastwards across the site towards the Irish Sea.

6.3 Groundwater

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

Groundwater was encountered during the ground investigation as water strikes at depths as shown in Table 6 below.

Table 6 Summary of groundwater strikes encountered during the ground investigation.

GI Ref	Water Level (mbgl)	Comments
WP03_BH05	1.00	
WP03_BH05	5.00	Rose to 4.80m after 20 mins
WP03_BH08	3.00	
WP03_BH10A	6.90	Rose to 6.00m after 20 mins
WP03_BH14	17.30	Major strike

WP03_TP01	1.750	
WP03_TP02	1.30	
WP03_TP04A	1.00	
WP03_TP08A	1.20	

Groundwater was not noted during drilling at some of the borehole locations. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any/additional groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out. It should also be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Groundwater was not noted in any of the other trial pit or slit trench excavations.

Seasonal variation in groundwater levels should also be factored into design considerations and continued monitoring of the installed standpipe will give an indication of the seasonal variation.

7 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland.

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. National Standards Authority of Ireland.

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

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

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

BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.

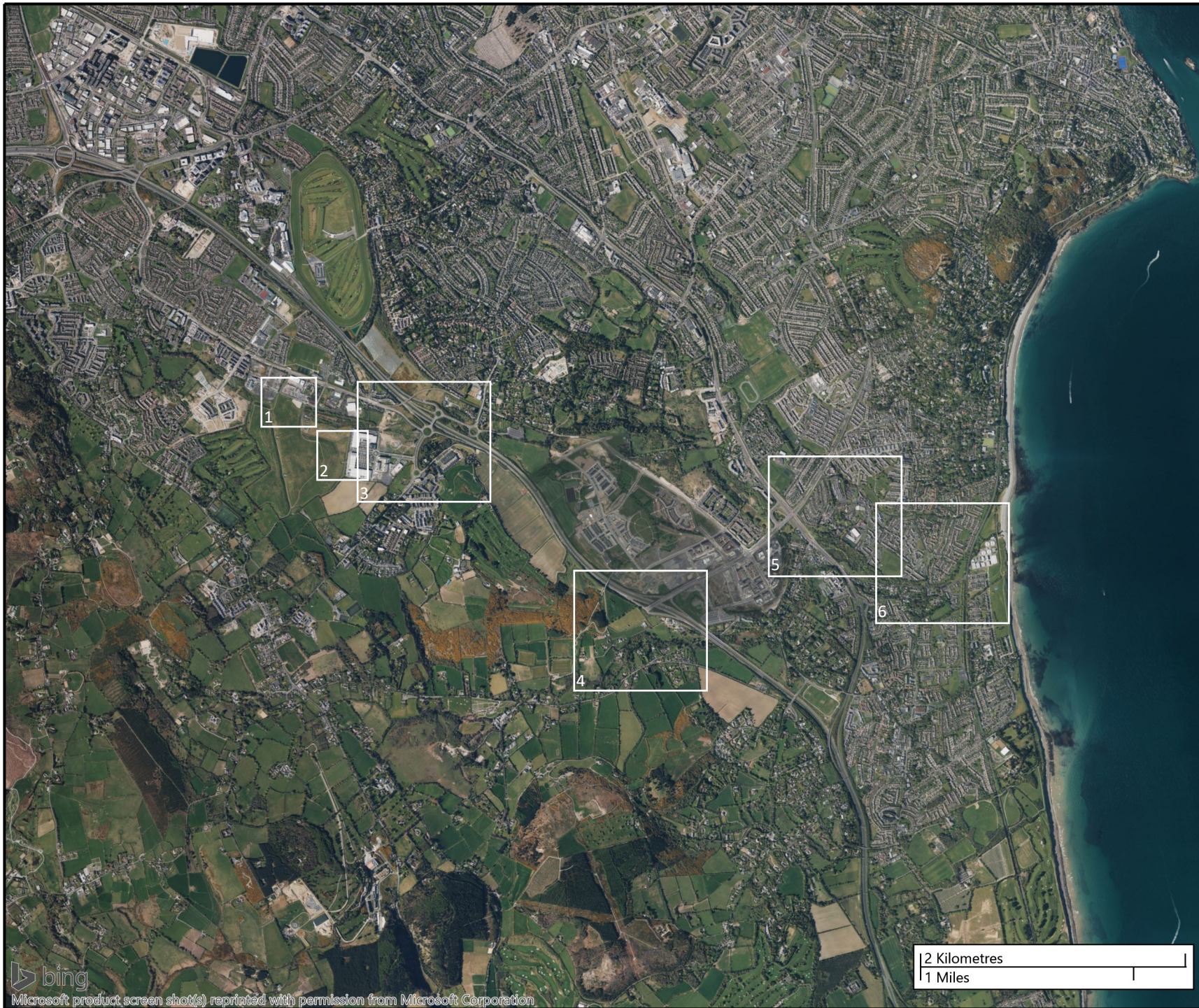
BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.



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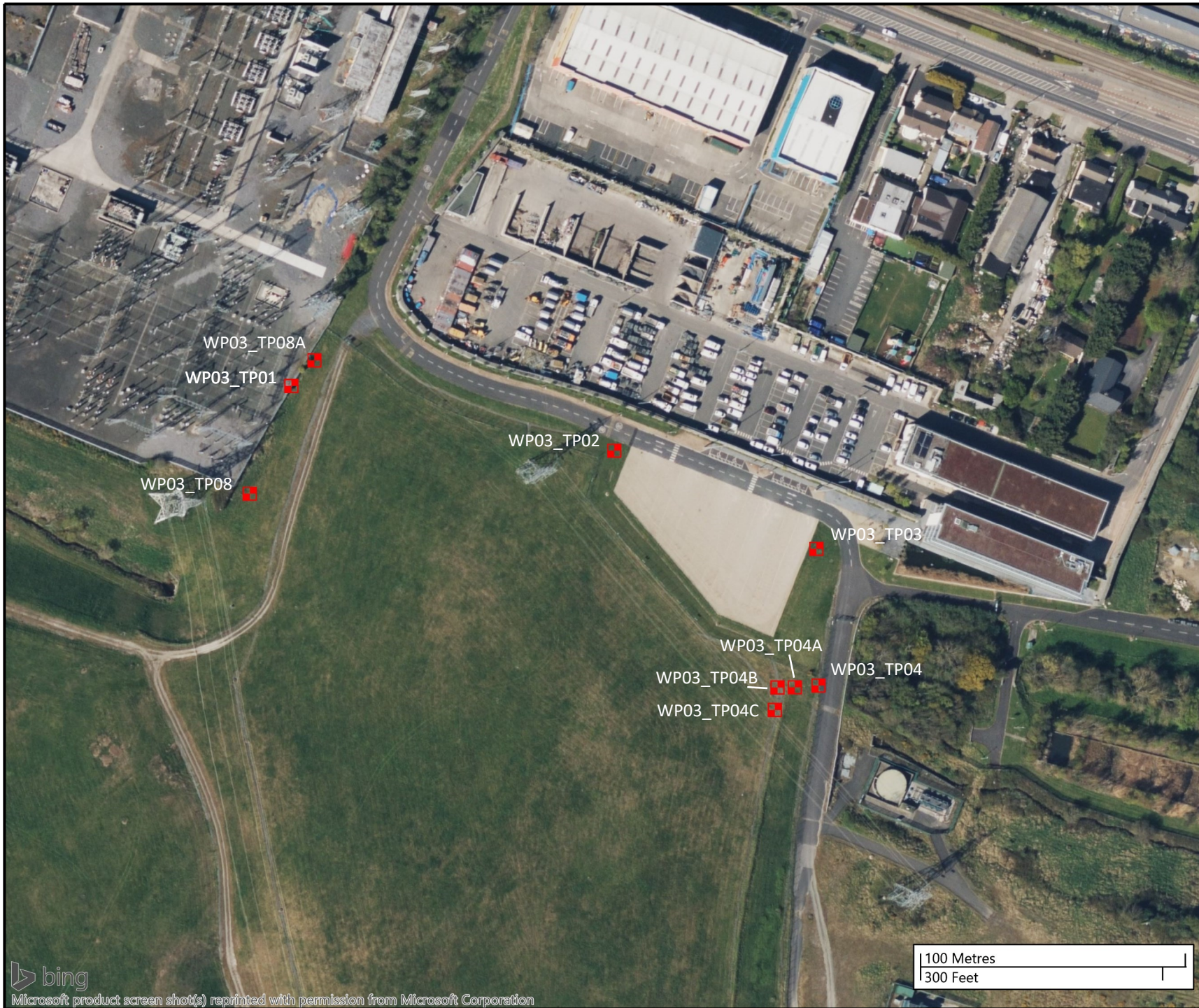
APPENDIX A
SITE AND EXPLORATORY HOLE LOCATION PLANS






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Legend Key	
Project No.	23-0343
Client	Dublin Array
Client's Rep	Gavin & Doherty Geosolutions (GDG)
Site Location Plan	
Dublin Array Onshore Cable Route	
	
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Scale	1:40000




Legend Key ▣ Locations By Type - TP	
Project No.	23-0343
Client	Dublin Array
Client's Rep	Gavin & Doherty Geosolutions (GDG)
Exploratory Hole Location Plan (Sheet 1 of 6)	
Dublin Array Onshore Cable Route	
	
Last Revision	06/02/2024
Scale	1:2000




Legend Key ▣ Locations By Type - TP	
Project No.	23-0343
Client	Dublin Array
Client's Rep	Gavin & Doherty Geosolutions (GDG)
Exploratory Hole Location Plan (Sheet 2 of 6)	
Dublin Array Onshore Cable Route	
	
Last Revision	06/02/2024
Scale	1:2000




Legend Key <ul style="list-style-type: none">Locations By Type - CPLocations By Type - CP+RCLocations By Type - RO+RC	
Project No.	23-0343
Client	Dublin Array
Client's Rep	Gavin & Doherty Geosolutions (GDG)
Exploratory Hole Location Plan (Sheet 3 of 6)	
Dublin Array Onshore Cable Route	
	
Last Revision	06/02/2024
Scale	1:5000




Legend Key <ul style="list-style-type: none">Locations By Type - CPLocations By Type - CP+RCLocations By Type - RO+RC	
Project No.	23-0343
Client	Dublin Array
Client's Rep	Gavin & Doherty Geosolutions (GDG)
Exploratory Hole Location Plan (Sheet 4 of 6)	
Dublin Array Onshore Cable Route	
	
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Scale	1:5000



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<div>Legend Key</div> <div><div><div></div>Locations By Type - CP</div><div><div></div>Locations By Type - CP+RC</div><div><div></div>Locations By Type - RO+RC</div></div>	
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<div><div></div><div>CAUSEWAY GEOTECH</div></div>	
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





Legend Key <ul style="list-style-type: none">Locations By Type - CPLocations By Type - CP+RCLocations By Type - RO+RC	
Project No.	23-0343
Client	Dublin Array
Client's Rep	Gavin & Doherty Geosolutions (GDG)
Exploratory Hole Location Plan (Sheet 6 of 6)	
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APPENDIX B
BOREHOLE LOGS





<div>CAUSEWAY GEOTECH</div>					Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH01					
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 9.80 m		Start Date: 05/10/2023		Driller: CB +SMW		Sheet 1 of 2 Scale: 1:50		
Cable Percussion Rotary Coring		Dando 2000 Comacchio 405		0.00 3.90	3.90 9.80	721376.66 E 723650.52 N		Elevation: 85.74 mOD		End Date: 05/10/2023		Logger: AK		FINAL		
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description				Water	Backfill	
0.20 - 1.20	B12	N=15 (1,2/2,2,5,6) Hammer SN = 1411			0.00	Dry	84.54	0.20		TOPSOIL: with fine roots (0.5-2.0mm).						0.5
0.20 - 1.20	B5							Soft becoming firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to medium.								
0.50	ES1															
1.00	D4															
1.00	ES2							Ublow=100 0% Recovery			2.00	Dry	82.74			
1.20 - 1.65	D3															
1.20 - 2.00	B7															
1.20 - 1.65	SPT (S)															
2.00	D9	N=36 (3,4/5,6,12,13) Hammer SN = 1411			3.00	Dry	81.94							3.00		Dense dark greyish black sandy silty subangular GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles are subrounded.
2.00 - 2.45	U6															
2.00 - 3.00	B8															
3.00	D10															
3.00 - 3.80	B11															
3.00 - 3.45	SPT (C)	50 (25 for 9mm/50 for 9mm) Hammer SN = 1411			3.90	2.80	80.74	3.80		Stiff light brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to medium.						
3.80																
3.90 - 3.92	SPT (C)															
			94	15	15	N/A				Very strong grey speckled orangish brown GRANITE. Moderately weathered: slightly closer fracture spacing. Discontinuities: 1. 20-30 degree joints, closely spaced (20/130/570), undulating, rough, with 5mm thick light brown clay infill some joints.						5.0
5.30							5.00									
			100	88	67	7										
6.80																
						16										
			100	100	62	12										6.0
																7.5
8.30																
			100	100	58	6										
							76.44	9.30								9.0
		TCR	SCR	RQD	FI											
Water Strikes				Chiselling Details			Remarks									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. No groundwater encountered - water added during rotary drilling.									
				2.10 3.80	2.30 3.90	00:45 01:00										
Casing Details		Water Added														
To (m)	Diam (mm)	From (m)	To (m)													
3.90 9.80	200 146	1.20	3.90													
				Core Barrel		Flush Type	Termination Reason				Last Updated					
				SK6L		Water	Terminated at scheduled depth.				06/02/2024					
























<div><div>CAUSEWAY GEOTECH</div></div>										Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route				Borehole ID WP03_BH01		
										Client: Dublin Array								
										Client's Rep: Gavin & Doherty Geosolutions (GDG)								
Method		Plant Used		Top (m)		Base (m)		Coordinates		Final Depth: 9.80 m		Start Date: 05/10/2023		Driller: CB +SMW		Sheet 2 of 2 Scale: 1:50		
Cable Percussion Rotary Coring		Dando 2000 Comacchio 405		0.00 3.90		3.90 9.80		721376.66 E 723650.52 N		Elevation: 85.74 mOD		End Date: 05/10/2023		Logger: AK		FINAL		
Depth (m)	Samples / Field Records			TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description			Water	Backfill	
9.80													End of Borehole at 9.80m					9.5
																		10.0
																		10.5
																		11.0
																		11.5
																		12.0
																		12.5
																		13.0
																		13.5
																		14.0
																		14.5
																		15.0
																		15.5
																		16.0
																		16.5
																		17.0
																		17.5
																		18.0
																		18.5
Water Strikes				Chiselling Details				Remarks										
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)		Inspection pit hand dug to 1.20m. No groundwater encountered - water added during rotary drilling.										
				2.10 3.80	2.30 3.90	00:45 01:00												
Casing Details				Water Added														
To (m)	Diam (mm)	From (m)	To (m)															
3.90 9.80	200 146	1.20	3.90															
				Core Barrel		Flush Type		Termination Reason						Last Updated		AGS		
				SK6L		Water		Terminated at scheduled depth.						06/02/2024				



Borehole ID
WP03 BH02

Water Strikes				Chiselling Details			Remarks		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. No groundwater encountered - water added during rotary drilling.		
				1.20 2.30	1.50 2.50	01:00 01:00			
Casing Details		Water Added							
To (m)	Diam (mm)	From (m)	To (m)						
2.30 9.80	200 146			Core Barrel	Flush Type	Termination Reason		Last Updated	
				SK6L	Water	Terminated at scheduled depth.		06/02/2024	

<div><div>CAUSEWAY GEOTECH</div></div>										Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH02	
Method Cable Percussion Rotary Coring		Plant Used Dando 2000 Comacchio 405		Top (m) 0.00 2.30		Base (m) 2.30 9.80		Coordinates 721516.28 E 723777.40 N		Final Depth: 9.80 m Start Date: 11/10/2023 Driller: CB +SMW		Sheet 2 of 2 Scale: 1:50					
								Elevation: 84.29 mOD End Date: 11/10/2023 Logger: AK		FINAL							
Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill				
9.80								74.49	9.80	+ + + + + + + + + + + + + + + +	End of Borehole at 9.80m			9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5			
		TCR	SCR	RQD	FI												
Water Strikes				Chiselling Details				Remarks									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. No groundwater encountered - water added during rotary drilling.										
				1.20 2.30	1.50 2.50	01:00 01:00											
Casing Details		Water Added															
To (m)	Diam (mm)	From (m)	To (m)														
2.30 9.80	200 146						Core Barrel	Flush Type	Termination Reason			Last Updated	AGS				
				SK6L			Water			Terminated at scheduled depth.			06/02/2024				


 CAUSEWAY GEOTECH				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH05											
Method Cable Percussion Rotary Drilling		Plant Used Dando 2000 Comacchio 405		Top (m) 0.00 0.60		Base (m) 0.60 10.00		Coordinates 724340.35 E 723413.74 N		Final Depth: 10.00 m Start Date: 17/10/2023 Driller: SMCW +CB		Sheet 1 of 2 Scale: 1:50									
								Elevation: 18.34 mOD End Date: 02/11/2023 Logger: SR		FINAL											
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description			Water	Backfill							
0.00		02-11-2023					18.14	0.20		TOPSOIL											
							17.74	0.60		MADE GROUND: Firm dark greyish brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is rounded					0.5						
1.00 - 2.50	B1									fine to coarse of granite.					1.0						
1.00 - 2.50	ES1	Strike at 1.00m.								MADE GROUND: Medium dense greyish brown gravelly slightly clayey fine to coarse SAND. (Driller's description)					1.5						
2.50 - 2.95	D7														2.0						
2.50 - 4.00	B2														2.5						
2.50 - 4.00	ES2														3.0						
2.50 - 2.95	SPT (S)	N=21 (4,3/6,5,5,5) Hammer SN = 0208			2.50	2.40									3.5						
4.00 - 4.45	D8														4.0						
4.00 - 5.50	B3														4.5						
4.00 - 5.50	ES3														5.0						
4.00 - 4.45	SPT (S)	N=41 (3,3/8,8,15,10) Hammer SN = 0208			4.00	2.80									5.5						
		Strike at 5.00m.													6.0						
5.50 - 5.95	D9						13.04	5.30		Dense yellowish brown gravelly silty fine to coarse SAND. (Driller's description)					6.5						
5.50 - 7.00	B4														7.0						
5.50 - 5.95	SPT (S)	N=40 (5,11/8,8,10,14) Hammer SN = 0208			5.50	3.10									7.5						
7.00 - 7.35	D10						11.34	7.00		Very dense yellowish brown sandy silty GRAVEL. (Driller's description)					8.0						
7.00 - 8.50	B5														8.5						
7.00 - 7.32	SPT (S)	50 (5,9/50 for 175mm) Hammer SN = 0208			7.00	5.30									9.0						
8.50 - 10.00	B6																				
8.50 - 8.62	SPT (C)	50 (25 for 100mm/50 for 25mm) Hammer SN = 0208			8.50	5.30															
Water Strikes				Chiselling Details				Remarks													
Struck at (m)		Casing to (m)		Time (min)		Rose to (m)		From (m)		To (m)		Time (hh:mm)		Inspection pit hand dug to 0.60m. No groundwater encountered. 7 attempts at a hand pit were undertaken, all terminated on concrete, bitmac or granite boulders.							
1.00		2.50		20																	
5.00		5.00		20		4.80															
Casing Details				Water Added																	
To (m)		Diam (mm)		From (m)		To (m)															
10.00		200																			
				Core Barrel		Flush Type		Termination Reason				Last Updated									
						Air		Terminated at scheduled depth.				06/02/2024									




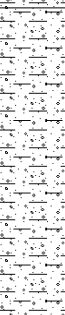
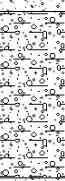
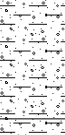
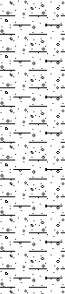











Borehole ID
WP03 BH05

Sheet 2 of 2
Scale: 1:50


















FINAL




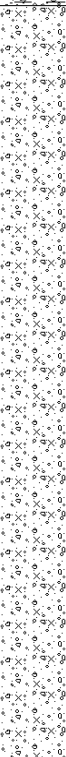

Water Strikes				Remarks	
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)		
1.00	2.50	20	4.80		
5.00	5.00	20			
Casing Details		Water Added			
To (m)	Diam (mm)	From (m)	To (m)		
10.00	200				
				Inspection pit hand dug to 0.60m. No groundwater encountered. 7 attempts at a hand pit were undertaken, all terminated on concrete, bitmac or granite boulders.	
Core Barrel		Flush Type	Termination Reason	Last Updated	
		Air	Terminated at scheduled depth.	06/02/2024	











 CAUSEWAY GEOTECH				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Borehole ID WP03_BH06			
						Client: Dublin Array						
						Client's Rep: Gavin & Doherty Geosolutions (GDG)						
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 21.80 m	Start Date: 03/11/2023	Driller: SMCW	Sheet 1 of 3 Scale: 1:50	
Rotary Percussion Rotary Coring		Comacchio 405 Comacchio 405		0.00 4.00	4.00 21.80	724540.80 E 723415.65 N		Elevation: 27.84 mOD	End Date: 07/11/2023	Logger: AK	FINAL	
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.00	B1						27.54	0.30		TOPSOIL		
							27.04	0.80		Very soft brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse. (Driller's description)		
1.00 - 2.50	B2									Firm light brown slightly sandy slightly gravelly CLAY. (Driller's description)		
2.50 - 2.95	D4	N=19 (3,4/4,5,5,5) Hammer SN = 0208			2.50		24.94	2.90		Stiff greyish brown slightly sandy slightly gravelly CLAY with low cobble content. (Driller's description)		
2.50 - 4.00	B3											
2.50 - 2.95	SPT (S)											
4.00 - 4.45	D5	N=31 (5,5/6,8,8,9) Hammer SN = 0208 03-11-2023			4.00	0.00	23.84	4.00		Very stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to medium.		
4.00 - 4.45	SPT (S)											
4.00		88			4.00	0.00						
							23.04	4.80		Very stiff greyish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium.		
5.30		100										
6.80					6.80	3.20						
6.80 - 7.25	SPT(C) N=37 (4,6/8,9,10,10) Hammer SN = 0208	95										
8.30		100										
		TCR	SCR	RQD	FI							
Water Strikes				Remarks								
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit hand dug to 1.20m. No groundwater encountered- water added during drilling.								
Casing Details				Water Added								
To (m)	Diam (mm)	From (m)	To (m)									
4.00	200	4.00	21.80									
21.80	146											
				Core Barrel	Flush Type	Termination Reason			Last Updated			
				SK6L	Polymer	Terminated at scheduled depth.			06/02/2024			

<div><div>CAUSEWAY GEOTECH</div></div>										Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route				Borehole ID WP03_BH06				
										Client: Dublin Array										
										Client's Rep: Gavin & Doherty Geosolutions (GDG)										
Method		Plant Used		Top (m)		Base (m)		Coordinates		Final Depth: 21.80 m		Start Date: 03/11/2023		Driller: SMCW		Sheet 2 of 3 Scale: 1:50				
Rotary Percussion Rotary Coring		Comacchio 405 Comacchio 405		0.00 4.00		4.00 21.80		724540.80 E 723415.65 N		Elevation: 27.84 mOD		End Date: 07/11/2023		Logger: AK		FINAL				
Depth (m)	Samples / Field Records		TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description				Water	Backfill			
9.80 9.80 - 10.25	SPT(C) N=44 (7,10/10,10,12,12) Hammer SN = 0208		100				9.80	3.40												
11.30									15.84	12.00		Brown very gravelly silty fine to coarse SAND. Gravel is subrounded fine to medium.								
12.80 12.80 - 13.06	SPT(C) 50 (12,12/50 for 115mm) Hammer SN = 0208		65				12.8	3.80												
14.30 14.30	07-11-2023		64				14.3	0.00				Very stiff dark brown very sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine.								
15.80 15.80 - 16.07	SPT(C) 50 (10,14/50 for 120mm) Hammer SN = 0208		52				15.8	12.4	12.04	15.80		Dense dark brown subrounded GRAVEL with high cobble content. Cobbles are subangular of mixed lithologies. (Fines likely washed out during drilling process)								
17.30			17																	
			TCR	SCR	RQD	FI														
Water Strikes						Chiselling Details				Remarks										
Struck at (m)		Casing to (m)		Time (min)		Rose to (m)		From (m)		To (m)		Time (hh:mm)		Inspection pit hand dug to 1.20m. No groundwater encountered- water added during drilling.						
Casing Details				Water Added				Core Barrel		Flush Type		Termination Reason				Last Updated				
To (m)		Diam (mm)		From (m)		To (m)														
4.00 21.80		200 146		4.00 21.80																
								SK6L		Polymer		Terminated at scheduled depth.				06/02/2024				

<div><div>CAUSEWAY GEOTECH</div></div>										Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH06	
Method Rotary Percussion Rotary Coring		Plant Used Comacchio 405 Comacchio 405		Top (m) 0.00 4.00		Base (m) 4.00 21.80		Coordinates 724540.80 E 723415.65 N		Final Depth: 21.80 m Elevation: 27.84 mOD		Start Date: 03/11/2023 End Date: 07/11/2023		Driller: SMCW Logger: AK		Sheet 3 of 3 Scale: 1:50 FINAL	
Depth (m)	Samples / Field Records		TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description				Water	Backfill
18.80	SPT(C) 50 (11,14/50 for 175mm) Hammer SN = 0208						18.8	13.2	9.04	18.80		Very stiff dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to medium.					
18.80 - 19.12																	
20.30	07-11-2023		100						7.54	20.30		Extremely weak light grey GRANITE. Highly weathered: greatly reduced strength. Discontinuities: 1. 70-80 degree joints, closely spaced (30/150/230), rough, with up to 70mm thick brown clay infill on some joints.					
21.80							21.8		6.04	21.80		End of Borehole at 21.80m					
21.80																	

<div>CAUSEWAY GEOTECH</div>				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH07																																																																																																																																
Method Cable Percussion Rotary Drilling		Plant Used Dando 2000 Comacchio 405		Top (m) 0.00 6.00		Base (m) 6.00 8.00		Coordinates 725002.67 E 723595.32 N		Final Depth: 8.00 m Start Date: 18/10/2023 Driller: CB +SMCW Elevation: 11.61 mOD End Date: 10/11/2023 Logger: SR		Sheet 1 of 1 Scale: 1:50 FINAL																																																																																																																														
<table><tr><td>Depth (m)</td><td>Sample / Tests</td><td>Field Records</td><td>Casing Depth (m)</td><td>Water Depth (m)</td><td>Level mOD</td><td>Depth (m)</td><td>Legend</td><td>Description</td><td>Water</td><td>Backfill</td><td></td></tr><tr><td>0.20 - 1.20</td><td>B4</td><td rowspan="5">N=6 (1,2/2,1,1,2) Hammer SN = 1411</td><td rowspan="5">0.00</td><td rowspan="5">0.00</td><td rowspan="5">11.41</td><td>0.20</td><td></td><td>TOPSOIL: with very fine roots (<0.5mm).</td><td rowspan="9"></td><td rowspan="9"></td><td rowspan="9"></td></tr><tr><td>0.50</td><td>ES1</td><td rowspan="8">MADE GROUND: Soft brownish grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.</td></tr><tr><td>1.00</td><td>D2</td></tr><tr><td>1.00</td><td>ES2</td></tr><tr><td>1.20 - 1.65</td><td>D5</td></tr><tr><td>1.20 - 2.00</td><td>B6</td></tr><tr><td>1.20 - 1.65</td><td>SPT (S)</td></tr><tr><td>2.00</td><td>D10</td></tr><tr><td>2.00</td><td>ES3</td></tr><tr><td>2.00 - 2.45</td><td>U7</td><td rowspan="4">Ublow=31 0% Recovery</td><td rowspan="4">2.00</td><td rowspan="4">Dry</td><td rowspan="4"></td><td rowspan="4"></td></tr><tr><td>2.00 - 3.00</td><td>B9</td></tr><tr><td>3.00</td><td>D11</td></tr><tr><td>3.00</td><td>ES4</td></tr><tr><td>3.00 - 3.45</td><td>SPT (C)</td><td rowspan="4">N=10 (1,2/3,3,2,2) Hammer SN = 1411</td><td rowspan="4">3.00</td><td rowspan="4">1.00</td><td rowspan="4">8.41</td><td>3.20</td><td></td><td>Loose becoming medium dense dark grey very sandy slightly silty angular to subangular fine to coarse GRAVEL. Sand is fine to coarse. Driller notes very strong hydrocarbon smell from 3.20-5.50m.</td></tr><tr><td>3.20 - 4.00</td><td>B8</td></tr><tr><td>4.00</td><td>D12</td></tr><tr><td>4.00</td><td>ES5</td></tr><tr><td>4.00 - 5.00</td><td>B15</td><td rowspan="4">N=23 (2,3/3,8,9,3) Hammer SN = 1411</td><td rowspan="4">4.00</td><td rowspan="4">3.20</td><td rowspan="4"></td><td rowspan="4"></td><td rowspan="4"></td></tr><tr><td>4.00 - 4.45</td><td>SPT (C)</td></tr><tr><td>5.00</td><td>D13</td></tr><tr><td>5.00</td><td>ES6</td></tr><tr><td>5.00 - 5.80</td><td>B16</td><td rowspan="4">N=20 (4,4/4,5,5,6) Hammer SN = 1411</td><td rowspan="4">5.00</td><td rowspan="4">1.80</td><td rowspan="4">6.11</td><td>5.50</td><td></td><td>Very stiff grey sandy SILT. Sand is fine to medium.</td></tr><tr><td>5.00 - 5.45</td><td>SPT (C)</td></tr><tr><td>5.50</td><td>ES7</td></tr><tr><td>6.00 - 6.06</td><td>SPT (C)</td></tr><tr><td>6.30 - 7.00</td><td>B21</td><td rowspan="4">50 (25 for 35mm/50 for 20mm) Hammer SN = 0208</td><td rowspan="4">7.00</td><td rowspan="4"></td><td rowspan="4">5.61</td><td>6.00</td><td></td><td>Very dense dark brownish grey sandy silty GRAVEL. (Driller's description)</td></tr><tr><td>7.00 - 8.00</td><td>B22</td></tr><tr><td>7.00 - 7.06</td><td>SPT (C)</td></tr><tr><td>8.00 - 8.06</td><td>SPT (C)</td></tr><tr><td></td><td></td><td>50 (25 for 35mm/50 for 20mm) Hammer SN = 0208</td><td>8.00</td><td></td><td>3.61</td><td>8.00</td><td></td><td>End of Borehole at 8.00m</td><td></td><td></td><td></td></tr></table>														Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill		0.20 - 1.20	B4	N=6 (1,2/2,1,1,2) Hammer SN = 1411	0.00	0.00	11.41	0.20		TOPSOIL: with very fine roots (<0.5mm).				0.50	ES1	MADE GROUND: Soft brownish grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	1.00	D2	1.00	ES2	1.20 - 1.65	D5	1.20 - 2.00	B6	1.20 - 1.65	SPT (S)	2.00	D10	2.00	ES3	2.00 - 2.45	U7	Ublow=31 0% Recovery	2.00	Dry			2.00 - 3.00	B9	3.00	D11	3.00	ES4	3.00 - 3.45	SPT (C)	N=10 (1,2/3,3,2,2) Hammer SN = 1411	3.00	1.00	8.41	3.20		Loose becoming medium dense dark grey very sandy slightly silty angular to subangular fine to coarse GRAVEL. Sand is fine to coarse. Driller notes very strong hydrocarbon smell from 3.20-5.50m.	3.20 - 4.00	B8	4.00	D12	4.00	ES5	4.00 - 5.00	B15	N=23 (2,3/3,8,9,3) Hammer SN = 1411	4.00	3.20				4.00 - 4.45	SPT (C)	5.00	D13	5.00	ES6	5.00 - 5.80	B16	N=20 (4,4/4,5,5,6) Hammer SN = 1411	5.00	1.80	6.11	5.50		Very stiff grey sandy SILT. Sand is fine to medium.	5.00 - 5.45	SPT (C)	5.50	ES7	6.00 - 6.06	SPT (C)	6.30 - 7.00	B21	50 (25 for 35mm/50 for 20mm) Hammer SN = 0208	7.00		5.61	6.00		Very dense dark brownish grey sandy silty GRAVEL. (Driller's description)	7.00 - 8.00	B22	7.00 - 7.06	SPT (C)	8.00 - 8.06	SPT (C)			50 (25 for 35mm/50 for 20mm) Hammer SN = 0208	8.00		3.61	8.00		End of Borehole at 8.00m			
Depth (m)	Sample / Tests	Field Records	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill																																																																																																																																
0.20 - 1.20	B4	N=6 (1,2/2,1,1,2) Hammer SN = 1411	0.00	0.00	11.41	0.20		TOPSOIL: with very fine roots (<0.5mm).																																																																																																																																		
0.50	ES1					MADE GROUND: Soft brownish grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.																																																																																																																																				
1.00	D2																																																																																																																																									
1.00	ES2																																																																																																																																									
1.20 - 1.65	D5																																																																																																																																									
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1.20 - 1.65	SPT (S)																																																																																																																																									
2.00	D10																																																																																																																																									
2.00	ES3																																																																																																																																									
2.00 - 2.45	U7	Ublow=31 0% Recovery	2.00	Dry																																																																																																																																						
2.00 - 3.00	B9																																																																																																																																									
3.00	D11																																																																																																																																									
3.00	ES4																																																																																																																																									
3.00 - 3.45	SPT (C)	N=10 (1,2/3,3,2,2) Hammer SN = 1411	3.00	1.00	8.41	3.20		Loose becoming medium dense dark grey very sandy slightly silty angular to subangular fine to coarse GRAVEL. Sand is fine to coarse. Driller notes very strong hydrocarbon smell from 3.20-5.50m.																																																																																																																																		
3.20 - 4.00	B8																																																																																																																																									
4.00	D12																																																																																																																																									
4.00	ES5																																																																																																																																									
4.00 - 5.00	B15	N=23 (2,3/3,8,9,3) Hammer SN = 1411	4.00	3.20																																																																																																																																						
4.00 - 4.45	SPT (C)																																																																																																																																									
5.00	D13																																																																																																																																									
5.00	ES6																																																																																																																																									
5.00 - 5.80	B16	N=20 (4,4/4,5,5,6) Hammer SN = 1411	5.00	1.80	6.11	5.50		Very stiff grey sandy SILT. Sand is fine to medium.																																																																																																																																		
5.00 - 5.45	SPT (C)																																																																																																																																									
5.50	ES7																																																																																																																																									
6.00 - 6.06	SPT (C)																																																																																																																																									
6.30 - 7.00	B21	50 (25 for 35mm/50 for 20mm) Hammer SN = 0208	7.00		5.61	6.00		Very dense dark brownish grey sandy silty GRAVEL. (Driller's description)																																																																																																																																		
7.00 - 8.00	B22																																																																																																																																									
7.00 - 7.06	SPT (C)																																																																																																																																									
8.00 - 8.06	SPT (C)																																																																																																																																									
		50 (25 for 35mm/50 for 20mm) Hammer SN = 0208	8.00		3.61	8.00		End of Borehole at 8.00m																																																																																																																																		
Water Strikes				Chiselling Details			Remarks																																																																																																																																			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. No groundwater encountered.																																																																																																																																			
				5.80	6.00	01:00																																																																																																																																				
Casing Details		Water Added																																																																																																																																								
To (m)	Diam (mm)	From (m)	To (m)																																																																																																																																							
6.00	200	1.20	5.80																																																																																																																																							
8.00	146																																																																																																																																									
				Core Barrel		Flush Type		Termination Reason				Last Updated																																																																																																																														
						Air		Terminated at scheduled depth.				06/02/2024																																																																																																																														

<div>CAUSEWAY GEOTECH</div>				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH08						
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 8.00 m		Start Date: 18/10/2023		Driller: CB +SMCW		Sheet 1 of 1 Scale: 1:50		
Cable Percussion Rotary Drillin		Dando 2000 Comacchio 405		0.00 3.00	3.00 8.00	725159.48 E 723527.56 N		Elevation: 9.15 mOD		End Date: 09/11/2023		Logger: SR		FINAL		
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description				Water	Backfill	
0.00		08-11-2023			5.50	3.00				TOPSOIL: with very fine roots (<0.5mm).						
0.20 - 1.20	B1						8.94	0.20		Firm dark brownish grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to medium Cobbles are subrounded.						0.5
0.50	ES5														1.0	
1.00	D7														1.5	
1.00	ES6				0.00	Dry									2.0	
1.20 - 1.65	D9														2.5	
1.20 - 2.00	B2														3.0	
1.20 - 1.65	SPT (S)	N=9 (2,2/2,2,2,3) Hammer SN = 1411													3.5	
2.00	D8				2.00	Dry				Very dense yellowish greyish brown very sandy silty subangular fine to medium GRAVEL. Sand is fine to coarse.						4.0
2.00 - 2.45	U4	Ublow=100 70% Recovery												4.5		
2.00 - 3.00	B3													5.0		
3.00 - 4.00	B10						6.14	3.00							5.5	
3.00 - 3.00	SPT (C)	50 (25 for 0mm/50 for 0mm) Hammer SN = 1411 Strike at 3.00m.													6.0	
4.00	D12										6.5					
4.00 - 5.50	B11										7.0					
4.00 - 4.36	SPT (S)	50 (2,9/50 for 205mm) Hammer SN = 1411			4.00	3.00					7.5					
5.50 - 7.00	B13										8.0					
5.50 - 5.85	SPT (S)	50 (4,10/50 for 200mm) Hammer SN = 1411			5.50	3.00					8.5					
7.00 - 8.00	B14										9.0					
7.00 - 7.30	SPT (C)	50 (12,12/50 for 147mm) Hammer SN = 1411			7.00	3.00										
8.00 - 8.36	SPT (C)	50 (25 for 140mm/50 for 225mm) Hammer SN = 1411 09-11-2023			8.00	3.00	1.14	8.00		End of Borehole at 8.00m						
8.00					8.00	3.00										
Water Strikes				Chiselling Details				Remarks								
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m.									
3.00	3.00	20	3.00	2.80	3.00	01:00										
Casing Details		Water Added														
To (m)	Diam (mm)	From (m)	To (m)													
3.00	200	1.20	3.00													
8.00	200				Core Barrel		Flush Type		Termination Reason				Last Updated			
						Air		Terminated at scheduled depth.				06/02/2024				


 CAUSEWAY GEOTECH				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH09								
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 8.00 m		Start Date: 09/10/2023	Driller: CB +SMCW	Sheet 1 of 1 Scale: 1:50						
Cable Percussion Rotary Percussion Rotary Coring		Dando 2000 Comacchio 405 Comacchio 405		0.00 6.30 6.70	6.30 6.70 8.00	725363.29 E 723193.00 N		Elevation: 12.75 mOD		End Date: 15/11/2023	Logger: SR	FINAL						
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description		Water	Backfill					
0.20 - 1.20	B2	50 (1,1/50 for 268mm) Hammer SN = 1411			0.00	Dry	12.55	0.20		TOPSOIL: with very fine roots (<0.5mm).								
0.50	ES6							0.50		Soft dark brownish slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium.								
1.00	D4							SPT at 1.20m due to cobble /boulder										
1.00	ES7																	
1.20 - 1.65	D1																	
1.20 - 2.00	B15																	
1.20 - 1.62	SPT (S)																	
2.00	D5							N=6 (1,1/1,1,2,2) Hammer SN = 1411			2.00			Dry			Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is rounded fine to medium.	
2.00 - 2.45	D3																	
2.00 - 3.00	B16																	
2.00 - 2.45	SPT (S)																	
3.00	D12	Ublow=63 100% Recovery			3.00	Dry			Very stiff brown sandy gravelly CLAY. (Driller's description)									
3.00 - 3.45	U9																	
3.00 - 4.00	B17																	
4.00	D13	N=31 (2,3/5,6,9,11) Hammer SN = 1411			4.00	Dry	8.95	3.80		Very stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium.								
4.00 - 4.45	D10																	
4.00 - 5.00	B18																	
4.00 - 4.45	SPT (S)																	
5.00	D14	Ublow=79 100% Recovery			5.00	Dry			Very stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium.									
5.00 - 5.45	U10																	
5.00 - 6.30	B19																	
6.00	D15	50 (25 for 0mm/50 for 0mm) Hammer SN = 1411			6.30	Dry		6.30		Very stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium.								
6.30 - 6.30	SPT (C)																	
8.00		50			8.00	Dry	4.75	8.00		End of Borehole at 8.00m								
8.00 - 8.45	SPT(S) N=42 (6,8/9,10,11,12) Hammer SN = 0208 15-11-2023																	
8.00																		
		TCR	SCR	RQD	FI													
Water Strikes				Chiselling Details			Remarks											
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. No groundwater encountered - water added during drilling.											
				1.60	2.00	01:00												
				6.20	6.30	01:00												
Casing Details		Water Added																
To (m)	Diam (mm)	From (m)	To (m)															
6.30	200	1.20	6.00															
6.70	200																	
8.00	146																	
				Core Barrel		Flush Type	Termination Reason				Last Updated							
				SK6L		Water/Air	Terminated at scheduled depth.				06/02/2024							



Borehole ID
WP03_BH10

FINAL

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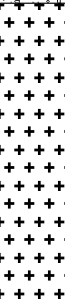



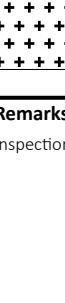




Water Strikes				Chiselling Details			Remarks		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. No groundwater encountered.		
				1.20	1.50	00:45			
				1.70	2.00	01:00			
Casing Details		Water Added							
To (m)	Diam (mm)	From (m)	To (m)				Termination Reason		
2.00	200	1.20	1.70						
5.30	146								
				Core Barrel		Flush Type	Last Updated		
						Polymer	06/02/2024		



Borehole ID
WP03_BH10
A

FINAL

Water Strikes				Remarks			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)				
6.90	7.00	20	6.00				
Casing Details		Water Added					
To (m)	Diam (mm)	From (m)	To (m)				
8.50 20.30	200 146						
Core Barrel		Flush Type	Termination Reason		Last Updated		<div><div></div><div>AGS</div></div>
		Polymer/Air	Terminated at scheduled depth.		06/02/2024		

								Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH10 A				
Method Rotary Percussion Rotary Coring		Plant Used Comacchio 405 Comacchio 405		Top (m) 0.00 8.50		Base (m) 8.50 20.30		Coordinates 721525.11 E 724258.83 N		Final Depth: 20.30 m Elevation: 75.71 mOD		Start Date: 24/10/2023 End Date: 25/10/2023		Driller: SMCW Logger: AK		Sheet 2 of 3 Scale: 1:50 FINAL		
Depth (m)	Samples / Field Records		TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description				Water	Backfill	
9.80 9.80 - 9.85	SPT(S) 50 (25 for 20mm/50 for 30mm) Hammer SN = 0208					NA	9.80	3.00										
												Strong light grey speckled dark grey GRANITE. Discontinuities: 1. 0-10 degree joints, medium spaced (20/526/560), undulating, rough, with 10mm thick brown clay infill on some joints.						
11.30																		
													Strong light grey speckled orangish brown GRANITE. Discontinuities: 1. 0-10 degree joints, medium spaced (20/230/470), undulating, rough, with 30mm thick light brown clay infill on some joints and 2. 40-50 degree joints, medium spaced (30/230/820), undulating, rough, with strong orange staining on most joint surfaces, with 40mm thick white calcite mineralization on some joints. <u>13.55-13.65m: Highly weathered granite.</u>					
12.80																		
													Strong light grey speckled dark grey GRANITE. Discontinuities: 1. 10-20 degree joints, medium spaced (230/370/790), undulating, rough, with 10mm thick dark grey clay infill on some joints. 2. 70-80 degree joints, medium spaced (100/230/560), undulating rough, with 20mm thick dark grey clay infill.					
14.30																		
15.80																		
17.30																		
Water Strikes			Chiselling Details			Remarks												
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m.											
6.90	7.00	20	6.00															
Casing Details			Water Added															
To (m)	Diam (mm)	From (m)	To (m)	Core Barrel		Flush Type	Termination Reason					Last Updated						
8.50 20.30	200 146					Polymer/Air	Terminated at scheduled depth.					06/02/2024						



Client's Rep: Gavin & Doherty Geosolutions (GDG)

Borehole ID
WP03_BH10
A

Sheet 3 of 3








Scale: 1:50

FINAI

Backfill



Terminated at scheduled depth.

 CAUSEWAY GEOTECH				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Borehole ID WP03_BH11			
						Client: Dublin Array						
						Client's Rep: Gavin & Doherty Geosolutions (GDG)						
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 20.30 m	Start Date: 11/10/2023	Driller: CB+SMW +SMW	Sheet 1 of 3 Scale: 1:50	
Cable Percussion Rotary Drilling Rotary Coring		Dando 2000 Comacchio 405 Comacchio 405		0.00 0.30 2.30	0.30 2.30 20.30	721364.91 E 724226.52 N		Elevation: 75.53 mOD	End Date: 19/10/2023	Logger: AK	FINAL	
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.30	B1	17-10-2023					75.43	0.10		TOPSOIL: with very fine roots (<0.5mm).		
0.30							75.23	0.30		Firm dark brownish slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded. Firm dark brown sandy gravelly CLAY. (Driller's description)		
2.30 - 2.75	SPT(S) N=17 (2,3/4,4,5) Hammer SN = 0208	18			2.30	0.00	73.23	2.30		Medium dense sandy clayey subangular fine to coarse GRAVEL. Sand is fine to coarse. (Driller notes a clay, fines likely washed out during drilling process)		
3.80					3.80	0.40						
3.80 - 4.25	SPT(S) N=19 (2,4/4,5,5,5) Hammer SN = 0208	46										
5.30					5.30	0.50	70.23	5.30		Stiff light brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular fine to coarse.		
5.30 - 5.75	SPT(S) N=19 (3,3/4,5,5,5) Hammer SN = 0208	100	48	34			69.48	6.05		Driller notes poor recovery from 2.30-3.80 due to cobble jamming in core barrel. Very strong light grey speckled dark grey GRANITE. Slightly weathered: slightly closer fracture spacing, light grey white calcite veining up to 60mm thick starting at 14.30m. Discontinuities: 1. 20-30 degree joints, closely spaced (20/80/1370), stepped, rough, with faint light brown staining on joint surfaces, with up to 3mm thick light brown clay infill on some joints. 2. 0-10 degree joints, closely spaced (80/180/600), undulating, rough, with 20mm thick light brown clay infill on some joints.		
6.80		98	94	94								
8.30		100	87	43								
		TCR	SCR	RQD	FI							
Water Strikes				Chiselling Details			Remarks					
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 0.30m. No groundwater encountered - water added during rotary drilling.					
Casing Details		Water Added										
To (m)	Diam (mm)	From (m)	To (m)									
2.30	146											
				Core Barrel		Flush Type	Termination Reason		Last Updated			
				SK6L		Polymer/ Polymer/Water	Terminated at scheduled depth.		06/02/2024			



Borehole ID
WP03 BH11

Water Strikes				Chiselling Details			Remarks		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 0.30m. No groundwater encountered - water added during rotary drilling.		
Casing Details		Water Added							
To (m)	Diam (mm)	From (m)	To (m)						
2.30	146			Core Barrel	Flush Type	Termination Reason	Last Updated	AGS	
				SK6L	Polymer/ Polymer/Water	Terminated at scheduled depth.	06/02/2024		




Borehole ID
WP03 BH11

Method	Plant Used	Top (m)	Base (m)
Cable Percussion	Dando 2000	0.00	0.30
Rotary Drilling	Comacchio 405	0.30	2.30
Rotary Coring	Comacchio 405	2.30	20.30







Final Depth: 20.30 m	Start Date: 11/10/2023	Driller: CB +SMW +SMW	Sheet 3 of 3 Scale: 1:50
Elevation: 75.53 mOD	End Date: 19/10/2023	Logger: AK	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill	
18.80					5			55.23	20.30	+ +				
20.30		28	26	26										
		TCR	SCR	RQD	FI									

Water Strikes				Chiselling Details			Remarks		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 0.30m. No groundwater encountered - water added during rotary drilling.		
Casing Details		Water Added							
To (m)	Diam (mm)	From (m)	To (m)						
2.30	146			Core Barrel	Flush Type	Termination Reason	Last Updated		
				SK6L	Polymer/ Polymer/Water	Terminated at scheduled depth.	06/02/2024		





 CAUSEWAY GEOTECH				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Borehole ID WP03_BH13			
						Client: Dublin Array						
						Client's Rep: Gavin & Doherty Geosolutions (GDG)						
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 20.30 m	Start Date: 06/10/2023	Driller: SMCW +CB	Sheet 1 of 3 Scale: 1:50	
Cable Percussion Rotary Drilling Rotary Coring		Dando 2000 Comacchio 405 Comacchio 405		0.00 1.90 4.00	1.90 4.00 20.30	723155.50 E 722695.83 N		Elevation: 77.22 mOD	End Date: 31/10/2023	Logger: AK+SR	FINAL	
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill
0.20 - 1.20 0.20 - 1.20 0.50	B3 B7 ES1						77.02	0.20		TOPSOIL: with very fine roots (<0.5mm). Dense greyish brown very gravelly silty fine to coarse SAND. Gravel is subangular fine to medium.		
1.00 1.00 1.20 - 1.65 1.20 - 1.48	D5 ES2 D4 SPT (S)	50 (3,6/50 for 135mm) Hammer SN = 1411			0.00	Dry						
1.70 1.90 2.00 - 4.00 2.00 - 2.02	D6 B8 SPT (C)	31-10-2023 50 (25 for 5mm/50 for 10mm) Hammer SN = 0208			2.00	Dry	75.32	1.90		Very dense brownish grey gravelly SAND. (Driller's description)		
4.00 - 4.03	SPT (C)	50 (25 for 10mm/50 for 20mm) Hammer SN = 0208			4.00		73.22	4.00		No Recovery: Driller notes yellowish brown grey gravelly SAND.		
5.30 5.30 - 5.34	SPT(C) 50 (25 for 10mm/50 for 25mm) Hammer SN = 0208				5.30	5.30						
6.80							71.52	5.70			Strong light grey speckled dark grey GRANITE. Slightly weathered: slightly closer fracture spacing. Discontinuities: 1. 40-50 degree joints, medium spaced (30/240/1130), undulating, rough, with strong dark orange staining on most joint surfaces, often with 2.5mm of brown clay infill on surfaces.	
8.30												
		TCR	SCR	RQD	FI							
Water Strikes				Chiselling Details			Remarks					
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. No groundwater encountered.					
				1.70	1.90	01:00						
Casing Details		Water Added										
To (m)	Diam (mm)	From (m)	To (m)									
1.90 4.00	200 200	4.00	20.30									
				Core Barrel	Flush Type	Termination Reason			Last Updated			
				SK6L	Air/Polymer	Terminated at scheduled depth.			06/02/2024			



Client's Rep: Gavin & Doherty Geosolutions (GDG)

Borehole ID
WP03 BH13


[illegible]








Water Strikes				Chiselling Details			Remarks		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. No groundwater encountered.		
				1.70	1.90	01:00			
Casing Details		Water Added							
To (m)	Diam (mm)	From (m)	To (m)						
1.90	200	4.00	20.30	Core Barrel	Flush Type	Termination Reason	Last Updated	<div><div></div><div>AGS</div></div>	
4.00	200								SK6L



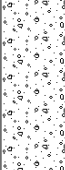

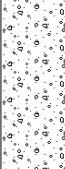

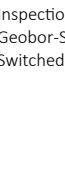









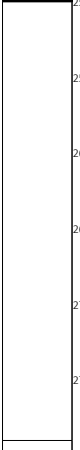
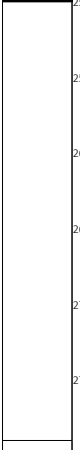

Borehole ID
WP03 BH13



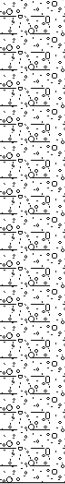

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Water Strikes				Chiselling Details			Remarks		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. No groundwater encountered.		
				1.70	1.90	01:00			
Casing Details		Water Added							
To (m)	Diam (mm)	From (m)	To (m)						
1.90	200	4.00	20.30	Core Barrel	Flush Type	Termination Reason	Last Updated		
4.00	200								SK6L

<div></div> <div>CAUSEWAY GEOTECH</div>				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH14											
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 25.00 m	Start Date: 20/10/2023	Driller: SMCW +CB	Sheet 1 of 3 Scale: 1:50										
Cable Percussion		Dando 2000		0.00	3.30	725826.04 E		Elevation: 7.46 mOD	End Date: 20/10/2023	Logger: SR+TG	FINAL										
Rotary Coring		Comacchio 405		2.50	17.30	723138.91 N															
Rotary Percussion		Comacchio 405		17.30	25.00																
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description	Water	Backfill									
0.20 - 1.20	B6	50 (25 for 10mm/50 for 45mm) Hammer SN = 1411			0.00	Dry	7.26	0.20		TOPSOIL: with very fine roots (<0.5mm).											
0.50	ES1															Dark greyish brown slightly sandy silty subangular fine to coarse GRAVEL. Sand is fine to coarse. Cobbles are subrounded.					
1.00	D3															Dense dark greyish brown slightly sandy silty subangular fine to coarse GRAVEL. Sand is fine to coarse. Cobbles are subrounded.					
1.00	ES2																				
1.20 - 2.00	B7																				
1.20 - 1.25	SPT (C)																				
2.00	D4						N=28 (4,6/7,7,6,8) Hammer SN = 0208 17-11-2023			2.00			1.50								
2.00 - 3.00	ES8																				
2.00 - 2.45	SPT (S)																				
2.50																					
3.00	D5	50 (6,7/50 for 112mm) Hammer SN = 0208			3.00	1.20															
3.00 - 4.00	B9																				
3.00 - 3.26	SPT (C)																				
3.80		25																			
3.80 - 4.07	SPT(C) 50 (8,8/50 for 115mm) Hammer SN = 0208							3.46	4.00												
4.00 - 5.00	B10	10																			
5.00 - 6.00	B11																				
5.30								1.96	5.50												
6.00 - 7.00	B12	20																			
6.80																					
6.80 - 7.06	SPT(C) 50 (7,8/50 for 110mm) Hammer SN = 0208																				
7.00 - 9.00	B13	20																			
8.30																					
9.00 - 11.00	B14	25						-0.94	8.40												
		TCR	SCR	RQD	FI																
Water Strikes				Chiselling Details				Remarks													
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Inspection pit hand dug to 1.20m. Geobor-S carried out from 2.00-17.30m, very little recovery due to granular nature of the soil. Switched to symmetrix from 17.30m with bulk bags taken of the strata encountered.														
17.30	17.50	20		1.20	1.50	00:45															
				3.30	3.30	01:00															
Casing Details		Water Added																			
To (m)	Diam (mm)	From (m)	To (m)																		
3.30	200	1.20	3.30																		
25.00	200			Core Barrel		Flush Type	Termination Reason			Last Updated											
				SK6L		Water/Air	Terminated at scheduled depth.			06/02/2024											

 CAUSEWAY GEOTECH						Project No. 23-0343				Project Name: Dublin Array Onshore Cable Route					Borehole ID WP03_BH14				
										Client: Dublin Array									
										Client's Rep: Gavin & Doherty Geosolutions (GDG)									
Method		Plant Used		Top (m)		Base (m)		Coordinates		Final Depth: 25.00 m		Start Date: 20/10/2023		Driller: SMCW +CB		Sheet 2 of 3 Scale: 1:50			
Cable Percussion		Dando 2000		0.00		3.30		725826.04 E		723138.91 N		7.46 mOD		20/10/2023		Logger: SR+TG		FINAL	
Rotary Coring		Comacchio 405		2.50		17.30													
Rotary Percussion		Comacchio 405		17.30		25.00													
Depth (m)		Samples / Field Records		TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description				Water	Backfill	
9.80		SPT(C) 50 (7,9/50 for 110mm) Hammer SN = 0208						9.80	9.00	-3.04	10.50		Low recovery: Very dense brownish grey slightly sandy subrounded fine to coarse GRAVEL of limestone with low cobble content. Sand is fine to coarse. Cobbles are of limestone						9.5
9.80 - 10.06				20															
11.30		SPT(C) 50 (9,10/50 for 125mm) Hammer SN = 0208						11.3	5.30										10.0
11.30 - 11.58				66															
12.00 - 14.00		B15		66															10.5
12.80		SPT(C) 50 (11,13/50 for 85mm) Hammer SN = 0208		25				12.8	3.40										
12.80 - 13.04															14.30-25.00m: No recovery				
14.00 - 15.00		B16						2.50	0.00										
14.30		20-11-2023																	11.5
14.30				0															
15.00 - 16.00		B17		0															12.0
15.80		SPT(C) 50 (25 for 85mm/50 for 60mm) Hammer SN = 0208		0				15.8	3.60										
15.80 - 15.94																			
16.00 - 17.00		B18																	
17.00 - 18.00		B19																	13.0
17.30		21-11-2023 SPT(C) 50 (25 for 85mm/50 for 60mm) Hammer SN = 0208 Major water strikes continued flow						13.0	0.00	-9.84	17.30								
17.30 - 17.64										17.5	4.50				Very dense greyish brown sandy slightly silty GRAVEL. (Driller's description)				
17.50								17.5	8.40										
18.00 - 19.00		B20																	14.0
Water Strikes						Chiselling Details						Remarks							
Struck at (m)		Casing to (m)		Time (min)		Rose to (m)		From (m)		To (m)		Time (hh:mm)		Inspection pit hand dug to 1.20m. Geobor-S carried out from 2.00-17.30m, very little recovery due to granular nature of the soil. Switched to symmetrix from 17.30m with bulk bags taken of the strata encountered.					
17.30		17.50		20				1.20		1.50		00:45							
								3.30		3.30		01:00							
Casing Details				Water Added				Core Barrel SK6L		Flush Type Water/Air		Termination Reason Terminated at scheduled depth.				Last Updated 06/02/2024			
To (m)		Diam (mm)		From (m)		To (m)													
3.30		200		1.20		3.30													
25.00		200																	

 <div>CAUSEWAY GEOTECH</div>				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH14			
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 25.00 m	Start Date: 20/10/2023	Driller: SMCW +CB	Sheet 3 of 3 Scale: 1:50		
Cable Percussion		Dando 2000		0.00	3.30	725826.04 E		Elevation: 7.46 mOD	End Date: 20/10/2023	Logger: SR+TG	FINAL		
Rotary Coring		Comacchio 405		2.50	17.30	723138.91 N							
Rotary Percussion		Comacchio 405		17.30	25.00	723138.91 N							
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description		Water	Backfill
19.00 - 20.00	B21												
20.00 - 21.00	B22												
20.50 - 20.60	SPT (C)	50 (25 for 50mm/50 for 50mm) Hammer SN = 0208			20.5	4.50							
21.00 - 22.00	B23												
22.00 - 23.00	B24												
23.50 - 23.59	SPT (C)	50 (25 for 50mm/50 for 40mm) Hammer SN = 0208			23.5	5.00							
25.00		23-11-2023			25.0	4.00	-17.54	25.00		End of Borehole at 25.00m			
Water Strikes				Remarks									
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	Inspection pit hand dug to 1.20m. Geobor-S carried out from 2.00-17.30m, very little recovery due to granular nature of the soil. Switched to symmetrix from 17.30m with bulk bags taken of the strata encountered.									
17.30	17.50	20											
Casing Details				Water Added									
To (m)	Diam (mm)	From (m)	To (m)										
3.30	200	1.20	3.30										
25.00	200												
				Core Barrel	Flush Type	Termination Reason				Last Updated			
				SK6L	Water/Air	Terminated at scheduled depth.				06/02/2024			

 CAUSEWAY GEOTECH				Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route Client: Dublin Array Client's Rep: Gavin & Doherty Geosolutions (GDG)				Borehole ID WP03_BH14 A					
Method		Plant Used		Top (m)	Base (m)	Coordinates		Final Depth: 2.80 m		Start Date: 21/10/2023	Driller:	Sheet 1 of 1 Scale: 1:40			
						725828.33 E 723138.33 N		Elevation: 7.51 mOD		End Date: 21/10/2023	Logger:	FINAL			
Depth (m)	Sample / Tests	Field Records			Casing Depth (m)	Water Depth (m)	Level mOD	Depth (m)	Legend	Description			Water	Backfill	
							7.31	0.20		TOPSOIL					
										Dense dark greyish brown slightly sandy very clayey subangular fine to coarse GRAVEL with medium cobble content. Sand is fine to coarse. Cobbles are subrounded.					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
Water Strikes				Chiselling Details				Remarks Inspection pit hand dug to 1.20m. No groundwater encountered.							
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)									
Casing Details				Water Added											
To (m)	Diameter	From (m)	To (m)												
							Termination Reason				Last Updated				
							Terminated at refusal on boulder. Scheduled for rotary follow on.				06/02/2024				



CAUSEWAY
— GEOTECH

APPENDIX C
CORE PHOTOGRAPHS





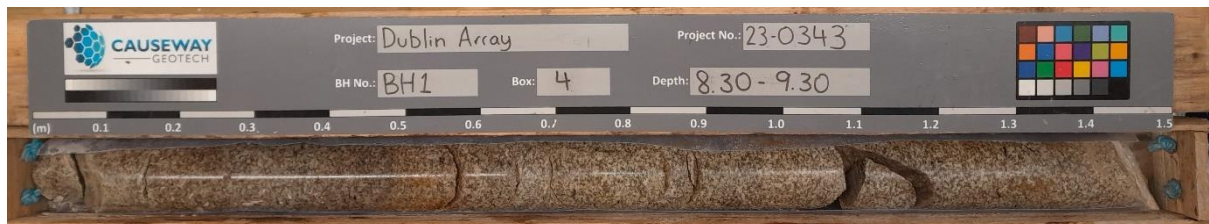
WP03_BH01 3.80-5.30m Box 1



WP03_BH01 5.30-6.80m Box 2



WP03_BH01 6.80-8.30m Box 3



WP03_BH01 8.30-9.30m Box 4



WP03_BH02 2.30-3.80m Box 1



WP03_BH02 3.80-5.30m Box 2



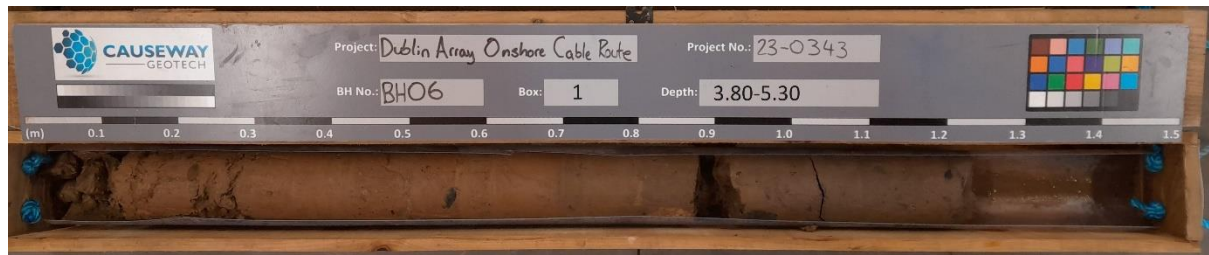
WP03_BH02 5.30-6.80m Box 3



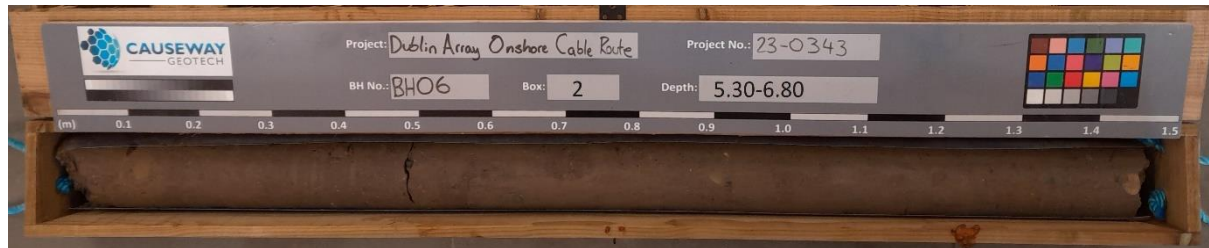
WP03_BH02 6.80-8.30m Box 4



WP03_BH02 8.30-9.80m Box 5



WP03_BH06 3.80-5.30m Box 1



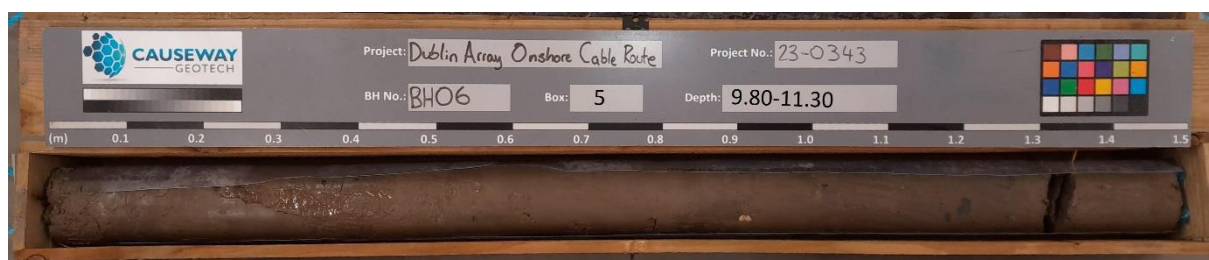
WP03_BH06 5.30-6.80m Box 2



WP03_BH06 6.80-8.30m Box 3



WP03_BH06 9.30-9.80m Box 4



WP03_BH06 9.80-11.30m Box 5



WP03_BH06 11.30-12.80m Box 6



WP03_BH06 12.80-14.30m Box 7



WP03_BH06 14.30-15.80m Box 8



WP03_BH06 15.80-17.30m Box 8



WP03_BH06 17.30-18.80m Box 8



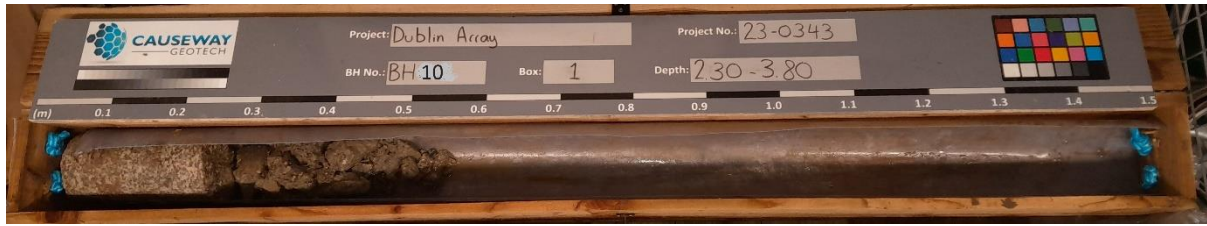
WP03_BH06 18.80-20.30m Box 8



WP03_BH06 20.30-21.80m Box 12



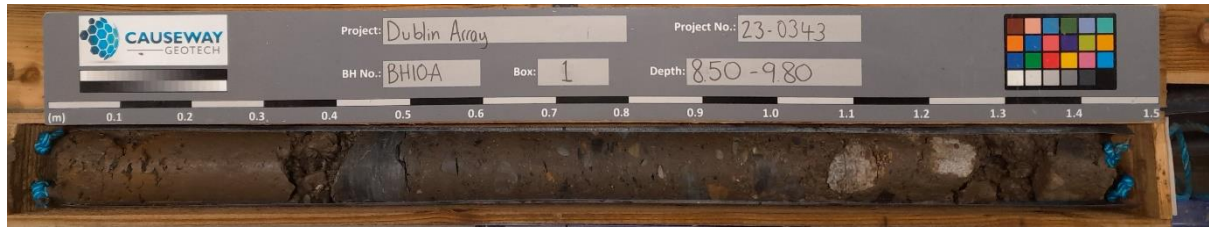
WP03_BH09 6.70-8.00m Box 1



WP03_BH10 2.30-3.80m Box 1



WP03_BH10 3.80-5.30m Box 2



WP03_BH10A 8.50-9.80m Box 1



WP03_BH10A 9.80-11.30m Box 2



WP03_BH10A 11.30-12.80m Box 3



WP03_BH10A 12.80-14.30m Box 4



WP03_BH10A 14.30-15.80m Box 5



WP03_BH10A 15.80-17.30m Box 6



WP03_BH10A 17.30-18.80m Box 7



WP03_BH10A 18.80-20.30m Box 8



WP03_BH11 2.30-3.80m Box 1



WP03_BH11 3.80-5.30m Box 2



WP03_BH11 5.30-6.80m Box 3



WP03_BH11 6.80-8.30m Box 4



WP03_BH11 8.30-9.80m Box 5



WP03_BH11 9.80-11.30m Box 6



WP03_BH11 11.30-12.80m Box 7



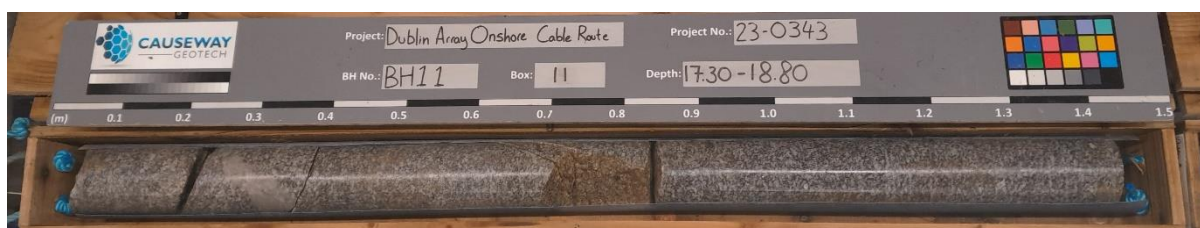
WP03_BH11 12.80-14.30m Box 8



WP03_BH11 14.30-15.80m Box 9



WP03_BH11 15.80-17.30m Box 10



WP03_BH11 17.30-18.80m Box 11



WP03_BH11 18.80-20.30m Box 12



WP03_BH13 5.30-6.80m Box 2



WP03_BH13 6.80-8.30m Box 3



WP03_BH13 8.30-9.80m Box 4



WP03_BH13 9.80-11.30m Box 5



WP03_BH13 11.30-12.80m Box 6



WP03_BH13 12.80-14.30m Box 7



WP03_BH13 14.30-15.80m Box 8



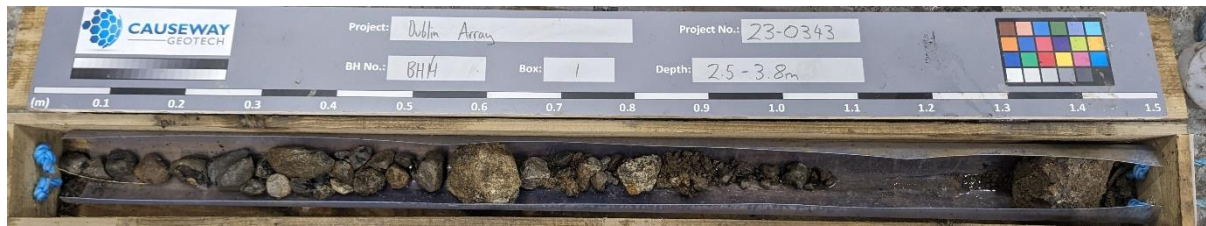
WP03_BH13 15.80-17.30m Box 9



WP03_BH13 17.30-18.80m Box 10



WP03_BH13 18.80-20.30m Box 11



WP03_BH14 2.30-3.80m Box 1



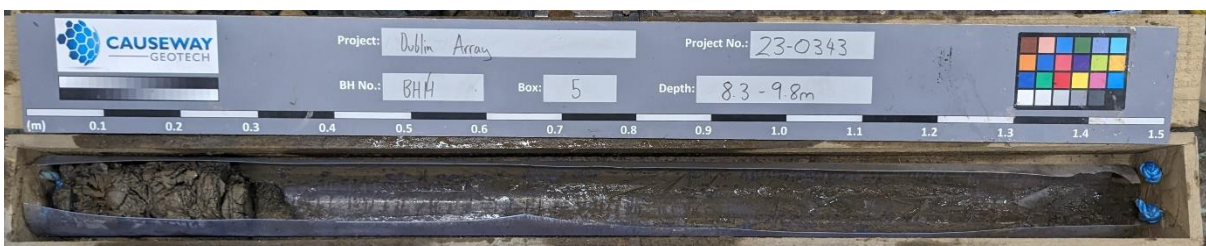
WP03_BH14 3.80-5.30m Box 2



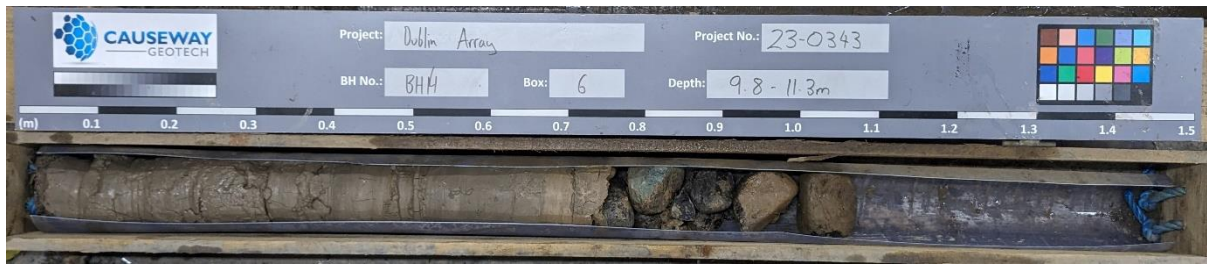
WP03_BH14 5.30-6.80m Box 3



WP03_BH14 6.80-8.30m Box 4



WP03_BH14 8.30-9.80m Box 5



WP03_BH14 9.80-11.30m Box 6



WP03_BH14 11.30-12.80m Box 7






WP03_BH14 12.80-14.30m Box 8



CAUSEWAY
— GEOTECH

APPENDIX D
TRIAL PIT AND SLIT TRENCH
LOGS AND DRAWINGS



<div><div>CAUSEWAY GEOTECH</div></div>			Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Trial Pit ID WP03_TP01			
			Coordinates 720400.63 E 724303.16 N		Client: Dublin Array Client's Representative: Gavin & Doherty Geosolutions (GDG)			Sheet 1 of 1 Scale: 1:25			
Method: Slit Trenching			Elevation 92.57 mOD		Date: 11/09/2023			Logger: RS		FINAL	
Plant: 3t Tracked Excavator											
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description				Water	
0.50	ES1					MADE GROUND: Reworked firm brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.					0.5
1.00	B2										1.0
		Seepage at 1.75m.	90.77	1.80		End of trial pit at 1.80m				▼	1.5
											2.0
											2.5
											3.0
											3.5
											4.0
											4.5
Water Strikes		Depth: 1.80		Remarks: LDPE Liner exposed.							
Struck at (m)	Remarks	Width: 0.60									
1.75	Seepage at 1.75m.	Length: 9.00									
		Stability: Stable		Termination Reason Terminated due to encountering LDPE liner.				Last Updated 06/02/2024			

JOB NUMBER:23-0343

JOB NAME:Dublin Array Onshore Cable Route

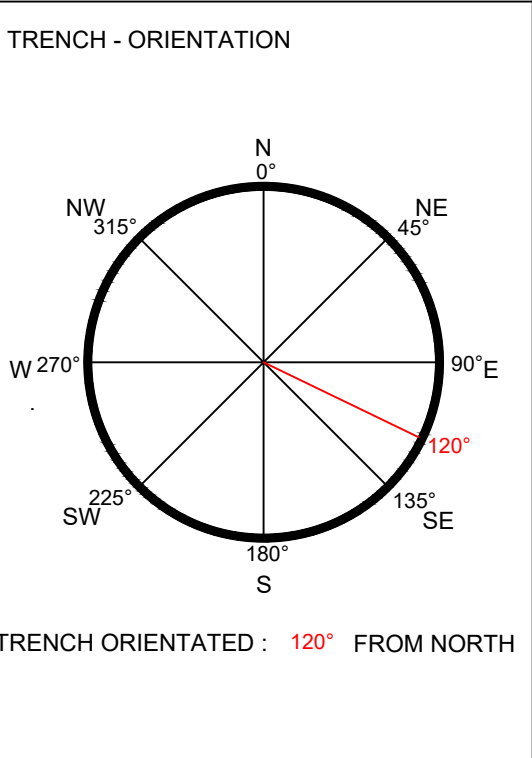
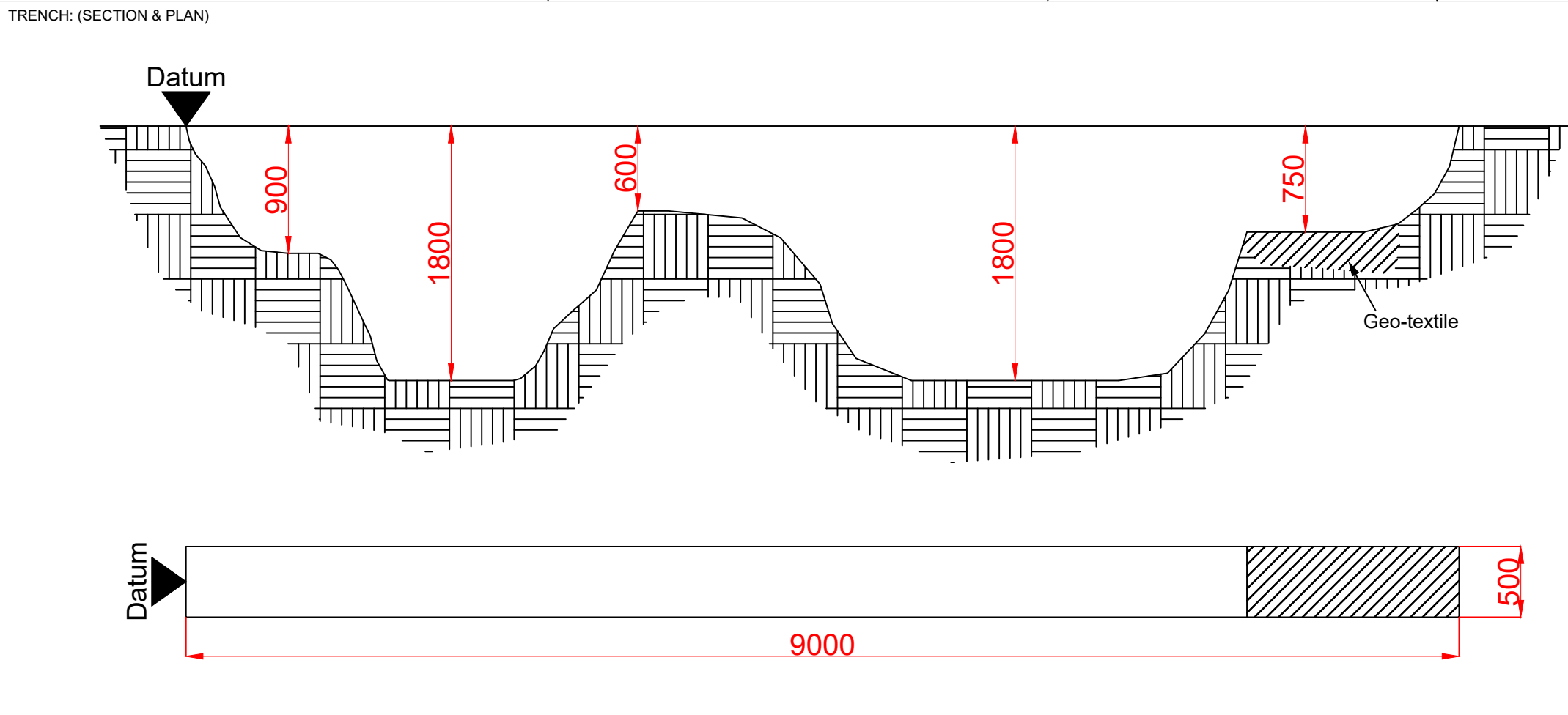
LOCATION:WP03-TP01

CLIENT:Dublin Array

CLIENTS REPRESENTATIVE:GDG

CREW:RS

PLANT & EQUIPMENT3 Tonne Excavator & Hand Tools



COORDINATES: DATUM

EASTING: 720400.63
NORTHING: 724303.16
ELEVATION: 92.57

TRENCH LENGTH (m): 9.00
TRENCH DEPTH (m): 1.80
TRENCH WIDTH (m): 0.50

STABILITY: GOOD
GROUNDWATER: NONE

SCALE: NTS@A3
DRAWN: BS
CHECKED: SR
DATE EXCAVATED: 11/09/2023

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Gasmain	150	1.00	0.72	No services found
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					





Project Name:
Dublin Array Onshore Cable Route

Trial Pit ID

WP03_TP02

Coordinates
720524.15 E
724281.74 N

Client:	Dublin Array
Client's Representative:	Gavin & Doherty Geosolutions (GDG)



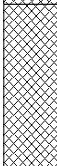
Sheet 1 of 1
Scale: 1:25


Elevation
93.14 mOD

Date:
12/09/2023

Logger:
RS

FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water	
0.50	ES1	Slow seepage	92.84	0.30		MADE GROUND: Stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
			92.69	0.45		MADE GROUND: Grey sandy very silty angular fine to coarse GRAVEL. Sand is fine to coarse.		
	1.00		B3	91.94	1.20			MADE GROUND: Stiff brown slightly sandy slightly gravelly CLAY with low cobble content and rare sheets of plastic. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.
								MADE GROUND: Firm brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.
1.50 1.50 1.50 - 1.50	B4 ES2 ES1	91.39	1.75	End of trial pit at 1.75m				

Water Strikes		Depth: 1.75 Width: 0.50 Length: 6.90	Remarks: ES at 0.5m taken in grass trench. ES at 1.50m taken in the road. LDPE Liner exposed within verge and road. Geogrid present within road section.	
Struck at (m)	Remarks			
1.30	Slow seepage			
		Stability: Stable	Termination Reason Terminated on Engineer's instruction.	Last Updated 06/02/2024
				

JOB NUMBER:23-0343

JOB NAME:Dublin Array Onshore Cable Route

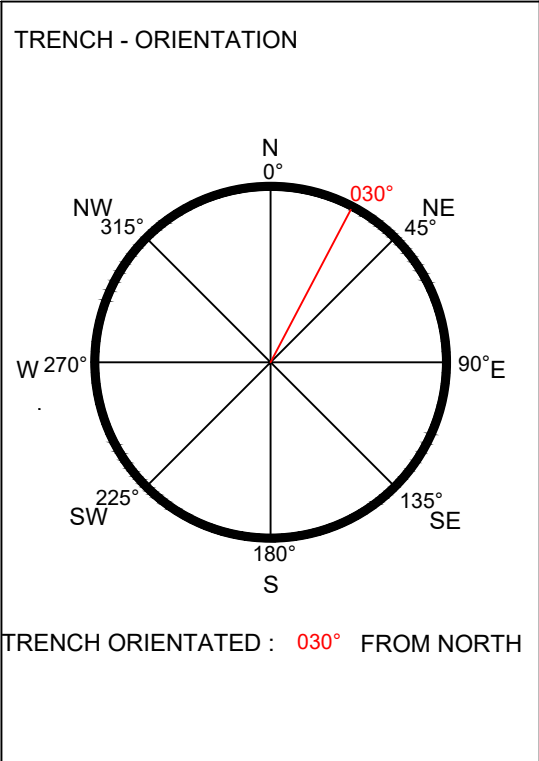
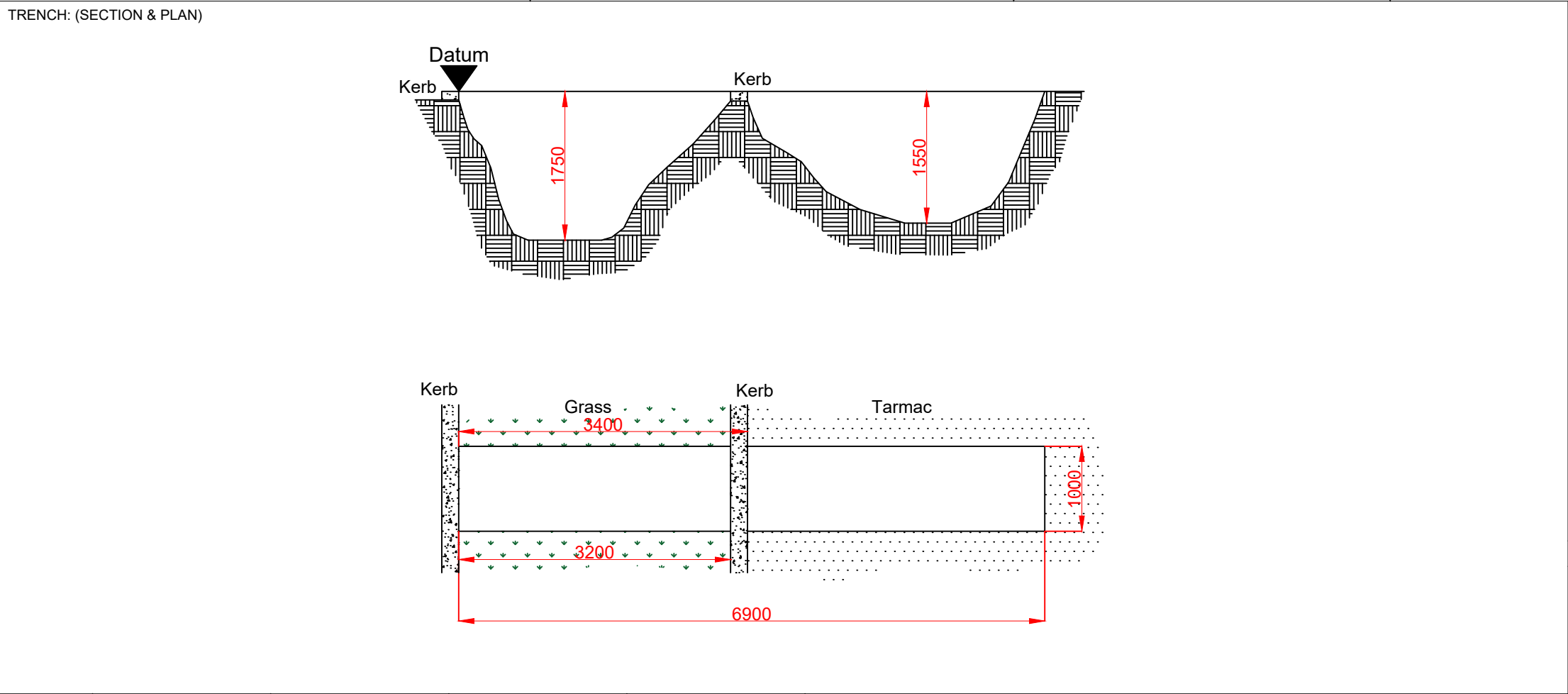
LOCATION:WP03-TP02

CLIENT:Dublin Array

CLIENTS REPRESENTATIVE:GDG

CREW:RS

PLANT & EQUIPMENT3 Tonne Excavator & Hand Tools



COORDINATES: DATUM


EASTING: 720524.15
NORTHING: 724281.74
ELEVATION: 93.14

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Gasmain	150	1.00	0.72	No services found
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					

TRENCH LENGTH (m) : 6.90
TRENCH DEPTH (m) : 1.55
TRENCH WIDTH (m) : 1.00

STABILITY: GOOD
GROUNDWATER: NONE

SCALE: NTS@A3
DRAWN: BS
CHECKED: SR
DATE EXCAVATED: 12/09/2023



CAUSEWAY
GEOTECH



23-0343

Dublin Array Onshore Cable Route

WP03_TP03

Slit Trenching

720601.89 E

724246.45 N

Dublin Array

Gavin & Doherty Geosolutions (GDG)

Scale: 1:25

3t Tracked Excavator

90.65 mOD

11/09/2023

RS

FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
0.40	B2		90.50	0.15		TOPSOIL: Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.	
0.40	ES3					MADE GROUND: Grey sandy very silty angular fine to coarse GRAVEL. Sand is fine to coarse.	
0.50	ES1		90.20	0.45		MADE GROUND: Firm brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	0.5
			89.55	1.10		End of trial pit at 1.10m	1.0
							1.5
							2.0
							2.5
							3.0
							3.5
							4.0
							4.5

Water Strikes		Depth: 1.10	Remarks:	
Struck at (m)	Remarks			
		Width: 0.60	ES and B at 0.4m taken in road. ES at 0.50m taken in grass trench. No groundwater encountered. Geogrid encountered in grass section.	
		Length: 13.05		
		Stability:	Termination Reason	Last Updated
		Stable	Terminated at refusal on concrete.	06/02/2024

JOB NUMBER:

23-0343

JOB NAME:

Dublin Array Onshore Cable Route

LOCATION:

WP03-TP03

CLIENT:

Dublin Array

CLIENTS REPRESENTATIVE:

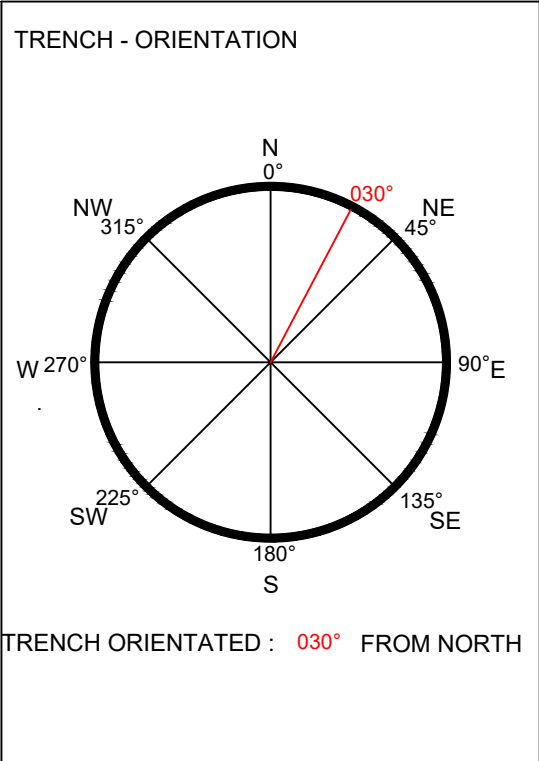
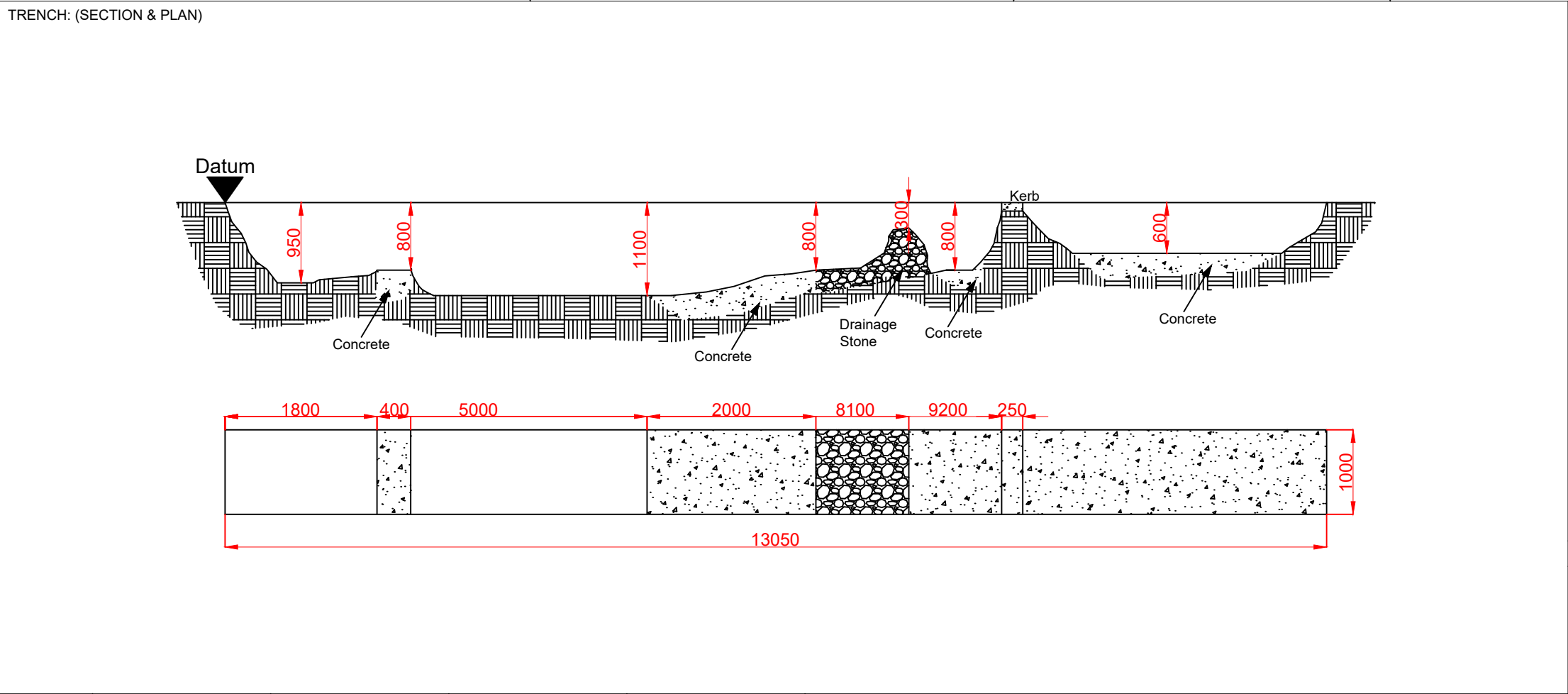
GDG

CREW:

RS

PLANT & EQUIPMENT




3 Tonne Excavator & Hand Tools

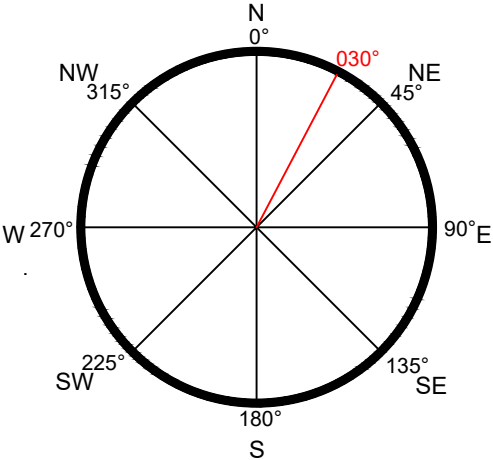
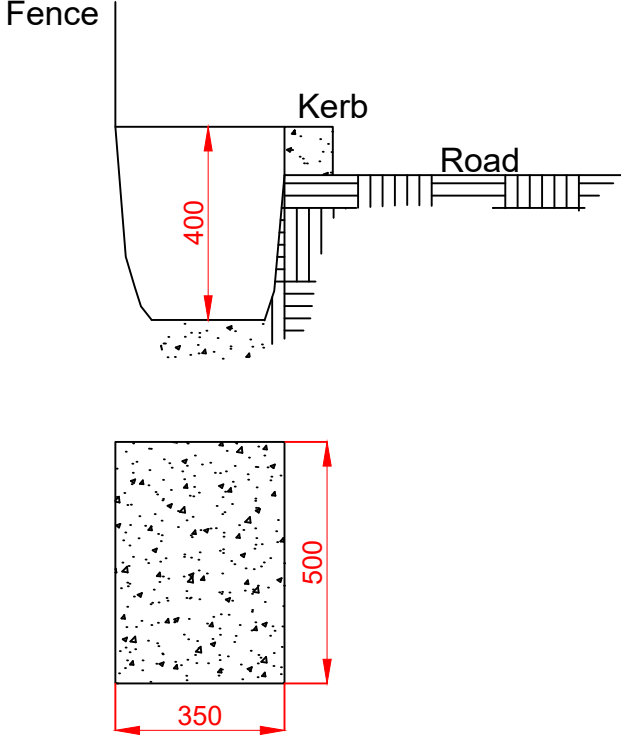



COORDINATES: DATUM	
EASTING:	720601.89
NORTHING:	724246.45
ELEVATION:	90.65
TRENCH LENGTH (m):	13.05
TRENCH DEPTH (m):	1.10
TRENCH WIDTH (m):	1.00
STABILITY:	GOOD
GROUNDWATER:	NONE
SCALE:	NTS@A3
DRAWN:	BS
CHECKED:	SR
DATE EXCAVATED:	11/09/2023

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Gasmain	150	1.00	0.72	No services found
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					



<div><div>CAUSEWAY GEOTECH</div></div>			Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Trial Pit ID WP03_TP04			
			Coordinates 720604.10 E 724194.60 N		Client: Dublin Array Client's Representative: Gavin & Doherty Geosolutions (GDG)			Sheet 1 of 1 Scale: 1:25			
Method: Slit Trenching			Elevation 87.03 mOD		Date: 12/09/2023			Logger: RS		FINAL	
Plant: Hand dug											
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description				Water	
0.40	ES1		86.63	0.40		MADE GROUND: Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.					
						End of trial pit at 0.40m					0.5
											1.0
											1.5
											2.0
											2.5
											3.0
											3.5
											4.0
											4.5
Water Strikes			Depth: 0.40		Remarks:						
Struck at (m)			Width: 0.35		No groundwater encountered.						
			Length: 0.70								
			Stability:		Termination Reason				Last Updated		
			Stable		Terminated at refusal on concrete.				06/02/2024		

JOB NUMBER: 23-0343		JOB NAME: Dublin Array Onshore Cable Route			LOCATION: WP03-TP04
CLIENT: Dublin Array		CLIENTS REPRESENTATIVE: GDG		CREW: RS	PLANT & EQUIPMENT 3 Tonne Excavator & Hand Tools
TRENCH: (SECTION & PLAN)					<div>TRENCH - ORIENTATION</div> <div></div> <div>TRENCH ORIENTATED : 030° FROM NORTH</div>
<div></div>					<div>COORDINATES: DATUM</div> <div>EASTING: 720604.10</div> <div>NORTHING: 724194.60</div> <div>ELEVATION: 87.03</div>
No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Gasmain	150	1.00	0.72	No services found
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					

 CAUSEWAY
GEOTECH

TRENCH LENGTH (m) : 0.35

TRENCH DEPTH (m) : 0.40

TRENCH WIDTH (m) : 0.50

STABILITY: GOOD




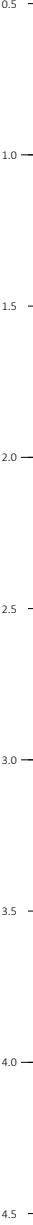


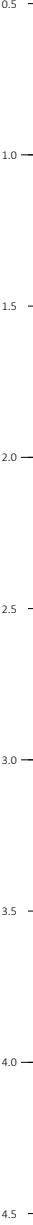


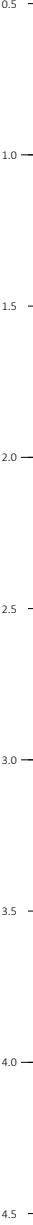



GROUNDWATER: NONE

SCALE: NTS@A3

DRAWN: BS

CHECKED: SR

DATE EXCAVATED: 12/09/2023

<div><div>CAUSEWAY GEOTECH</div></div>			Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Trial Pit ID WP03_TP04 A																												
			Coordinates 720595.04 E 724193.73 N		Client: Dublin Array Client's Representative: Gavin & Doherty Geosolutions (GDG)			Sheet 1 of 1 Scale: 1:25																												
Method: Slit Trenching			Elevation 88.62 mOD		Date: 10/10/2023			Logger: RS		FINAL																										
Plant: 3t Tracked Excavator																																				
<table><tr><th>Depth (m)</th><th>Sample / Tests</th><th>Field Records</th><th>Level (mOD)</th><th>Depth (m)</th><th>Legend</th><th>Description</th><th>Water</th><th></th></tr><tr><td rowspan="4">1.40 1.40 - 1.40</td><td rowspan="4">ES2 ES1</td><td rowspan="4">Slow</td><td>88.22</td><td>0.40</td><td rowspan="3"></td><td>MADE GROUND: Soft brown slightly sandy gravelly CLAY with low cobble content and rare sheets of plastic. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.</td><td rowspan="4"></td><td rowspan="4"></td></tr><tr><td>87.62</td><td>1.00</td><td>MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.</td></tr><tr><td>87.12</td><td>1.50</td><td>MADE GROUND: Soft grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular.</td></tr><tr><td colspan="2">End of trial pit at 1.50m</td></tr></table>											Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water		1.40 1.40 - 1.40	ES2 ES1	Slow	88.22	0.40		MADE GROUND: Soft brown slightly sandy gravelly CLAY with low cobble content and rare sheets of plastic. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.			87.62	1.00	MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.	87.12	1.50	MADE GROUND: Soft grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular.	End of trial pit at 1.50m	
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water																													
1.40 1.40 - 1.40	ES2 ES1	Slow	88.22	0.40		MADE GROUND: Soft brown slightly sandy gravelly CLAY with low cobble content and rare sheets of plastic. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.																														
			87.62	1.00		MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.																														
			87.12	1.50		MADE GROUND: Soft grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular.																														
			End of trial pit at 1.50m																																	
<table><tr><td colspan="2">Water Strikes</td><td rowspan="3">Depth: 1.50 Width: 0.50 Length: 8.70 Stability: Stable</td><td rowspan="3">Remarks: LDPE liner exposed.</td><td rowspan="3">Termination Reason Terminated on Engineer's instruction.</td><td rowspan="3">Last Updated 06/02/2024</td><td rowspan="3"></td></tr><tr><td>Struck at (m)</td><td>Remarks</td></tr><tr><td>1.00</td><td>Slow</td></tr></table>											Water Strikes		Depth: 1.50 Width: 0.50 Length: 8.70 Stability: Stable	Remarks: LDPE liner exposed.	Termination Reason Terminated on Engineer's instruction.	Last Updated 06/02/2024		Struck at (m)	Remarks	1.00	Slow															
Water Strikes		Depth: 1.50 Width: 0.50 Length: 8.70 Stability: Stable	Remarks: LDPE liner exposed.	Termination Reason Terminated on Engineer's instruction.	Last Updated 06/02/2024																															
Struck at (m)	Remarks																																			
1.00	Slow																																			

JOB NUMBER:

23-0343

JOB NAME:

Dublin Array Onshore Cable Route

LOCATION:

WP03-TP04A

CLIENT:

Dublin Array

CLIENTS REPRESENTATIVE:

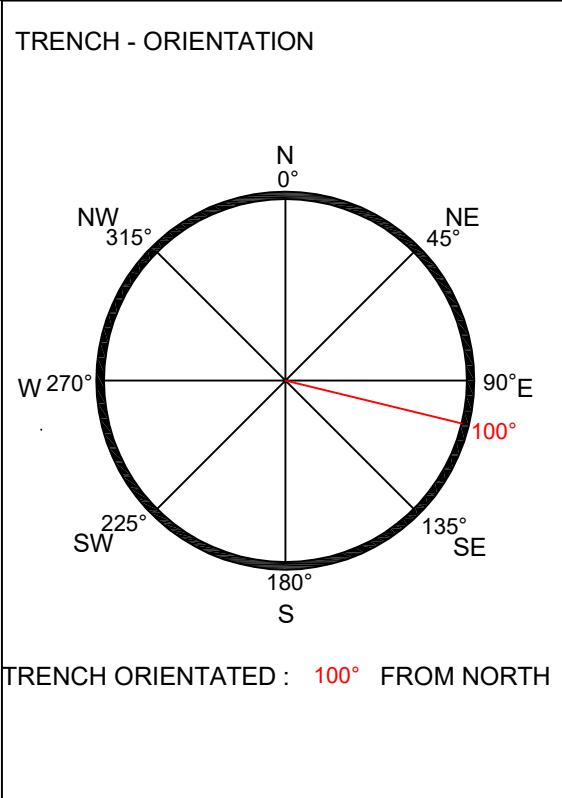
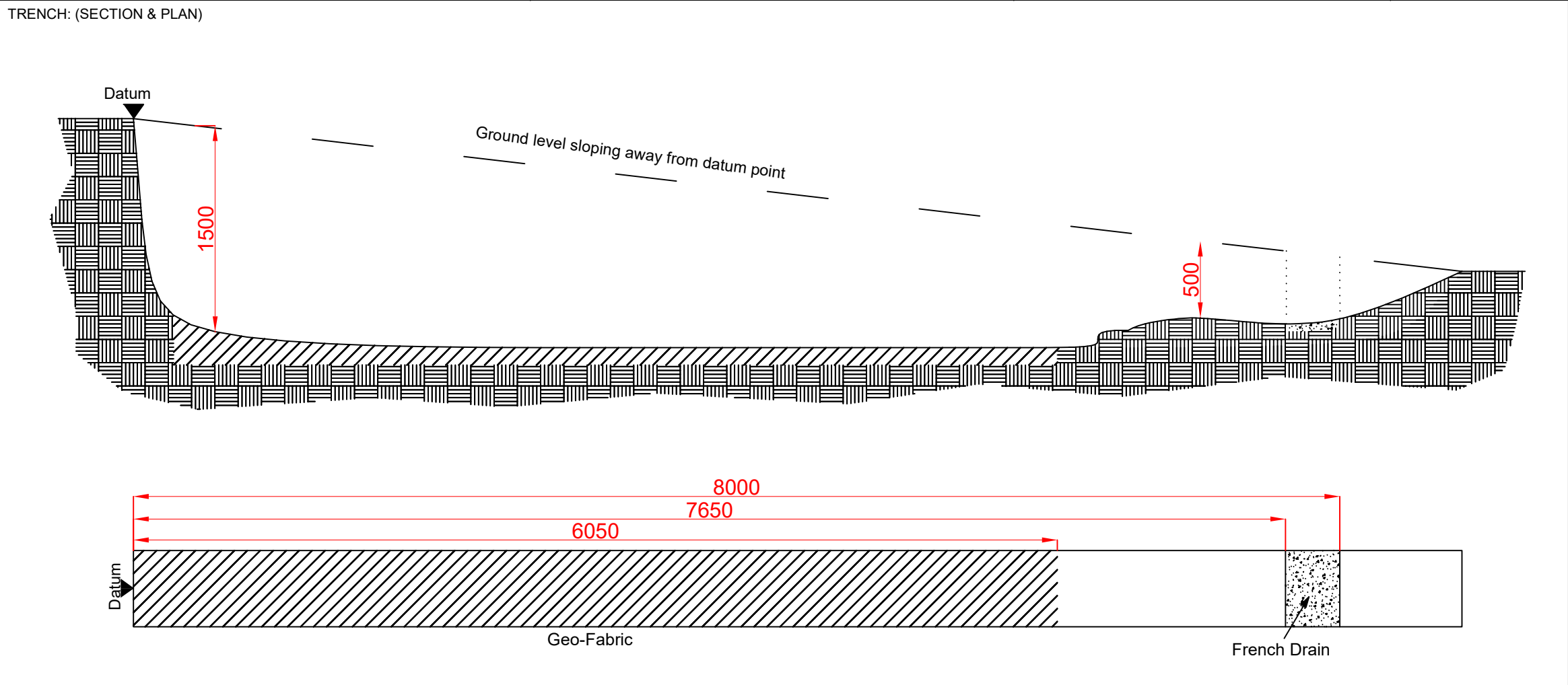
GDG

CREW:

RS

PLANT & EQUIPMENT

3 Tonne Excavator & Hand Tools



COORDINATES: DATUM

EASTING: 720595.04

NORTHING: 724193.73

ELEVATION: 88.62

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01					No services found
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					

TRENCH LENGTH (m): 8.70

TRENCH DEPTH (m): 0.50 - 1.50

TRENCH WIDTH (m): 0.50

STABILITY: GOOD


GROUNDWATER: STANDING WATER AT BASE

SCALE: NTS@A3

DRAWN: MD

CHECKED: SR

DATE EXCAVATED: 10/10/2023



CAUSEWAY
GEOTECH



Project Name:
Dublin Array Onshore Cable Route

Trial Pit ID
WP03_TP04
B

Method:
Slit Trenching

Coordinates
720588.33 E
724193.46 N

Client:
Dublin Array

Client's Representative:
Gavin & Doherty Geosolutions (GDG)

Sheet 1 of 1
Scale: 1:25

Plant:
3t Tracked Excavator


Elevation
38.90 mOD

Date:
10/10/2023

Logger:
RS

FINAL

[illegible]

Water Strikes		Depth: 0.60 Width: 0.50 Length: 1.00	Remarks: No groundwater encountered. LDPE liner exposed.		
Struck at (m)	Remarks				
		Stability: Moderately stable	Termination Reason Terminated on Engineer's instruction.	Last Updated 06/02/2024	

JOB NUMBER:23-0343

JOB NAME:Dublin Array Onshore Cable Route

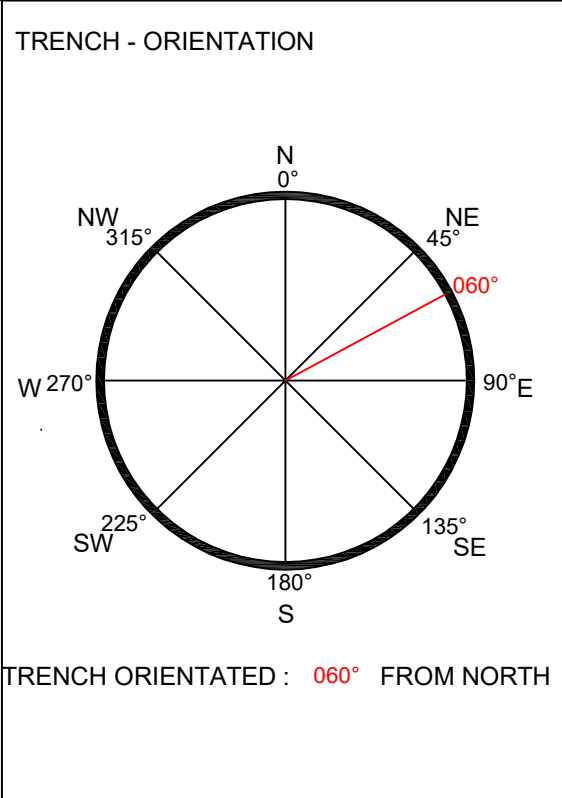
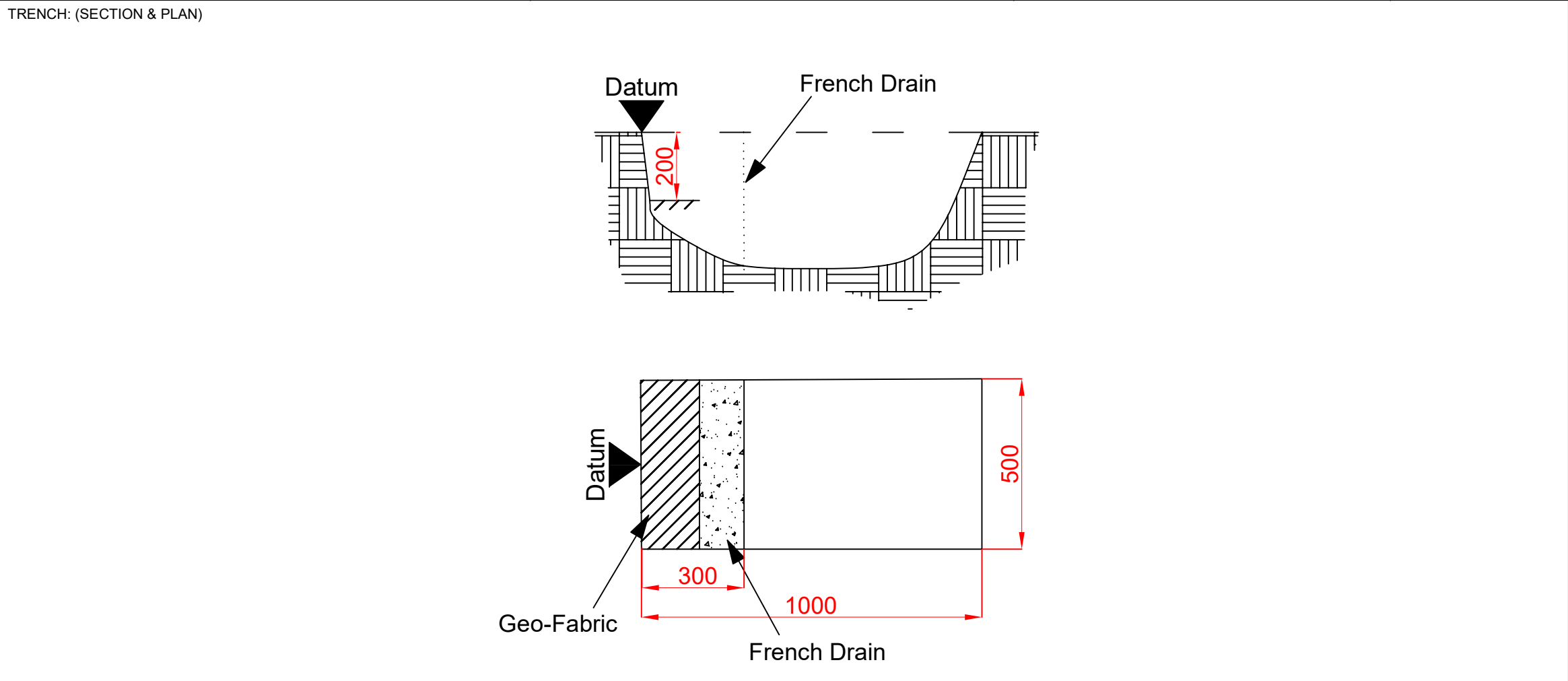
LOCATION:WP03-TP04B

CLIENT:Dublin Array

CLIENTS REPRESENTATIVE:GDG

CREW:RS

PLANT & EQUIPMENT3 Tonne Excavator & Hand Tools



COORDINATES: DATUM

EASTING: 720588.33

NORTHING: 724193.46

ELEVATION: 88.90

TRENCH LENGTH (m): 1.00

TRENCH DEPTH (m): 0.40

TRENCH WIDTH (m): 0.50

STABILITY: GOOD

GROUNDWATER: NONE

SCALE: NTS@A3




DRAWN: MD

CHECKED: SR

DATE EXCAVATED: 10/10/2023

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01					No services found
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					



<div><div>CAUSEWAY GEOTECH</div></div>			Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Trial Pit ID WP03_TP04 C				
			Coordinates 720587.53 E 724184.92 N		Client: Dublin Array Client's Representative: Gavin & Doherty Geosolutions (GDG)			Sheet 1 of 1 Scale: 1:25				
Method: Slit Trenching			Elevation 88.76 mOD		Date: 10/10/2023			Logger: RS		FINAL		
Plant: 3t Tracked Excavator												
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description				Water		
			88.16	0.60		MADE GROUND: Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.					0.5	
						End of trial pit at 0.60m					1.0	
											1.5	
											2.0	
											2.5	
											3.0	
											3.5	
											4.0	
											4.5	
Water Strikes			Depth: 0.60		Remarks: No groundwater encountered. LDPE liner exposed.							
Struck at (m)			Width: 0.50									
			Length: 1.40									
			Stability: Unstable		Termination Reason Terminated on Engineer's instruction.				Last Updated 06/02/2024			

JOB NUMBER:23-0343

JOB NAME:Dublin Array Onshore Cable Route

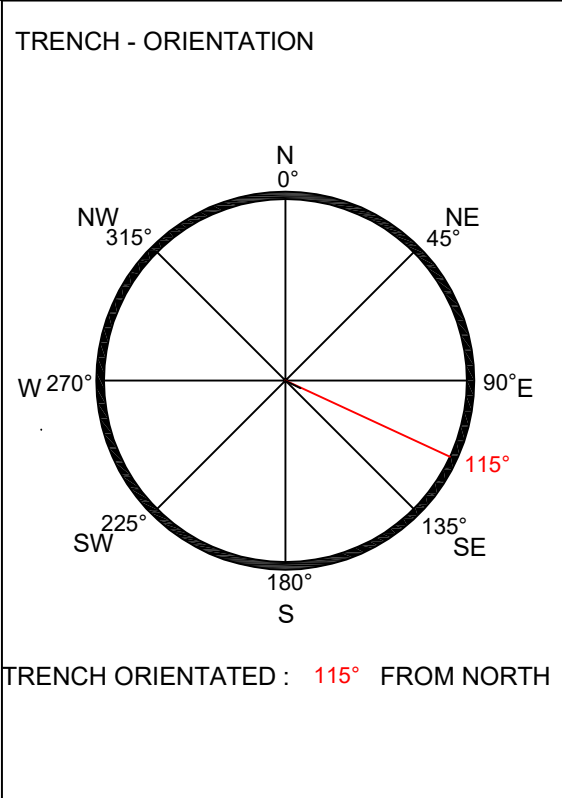
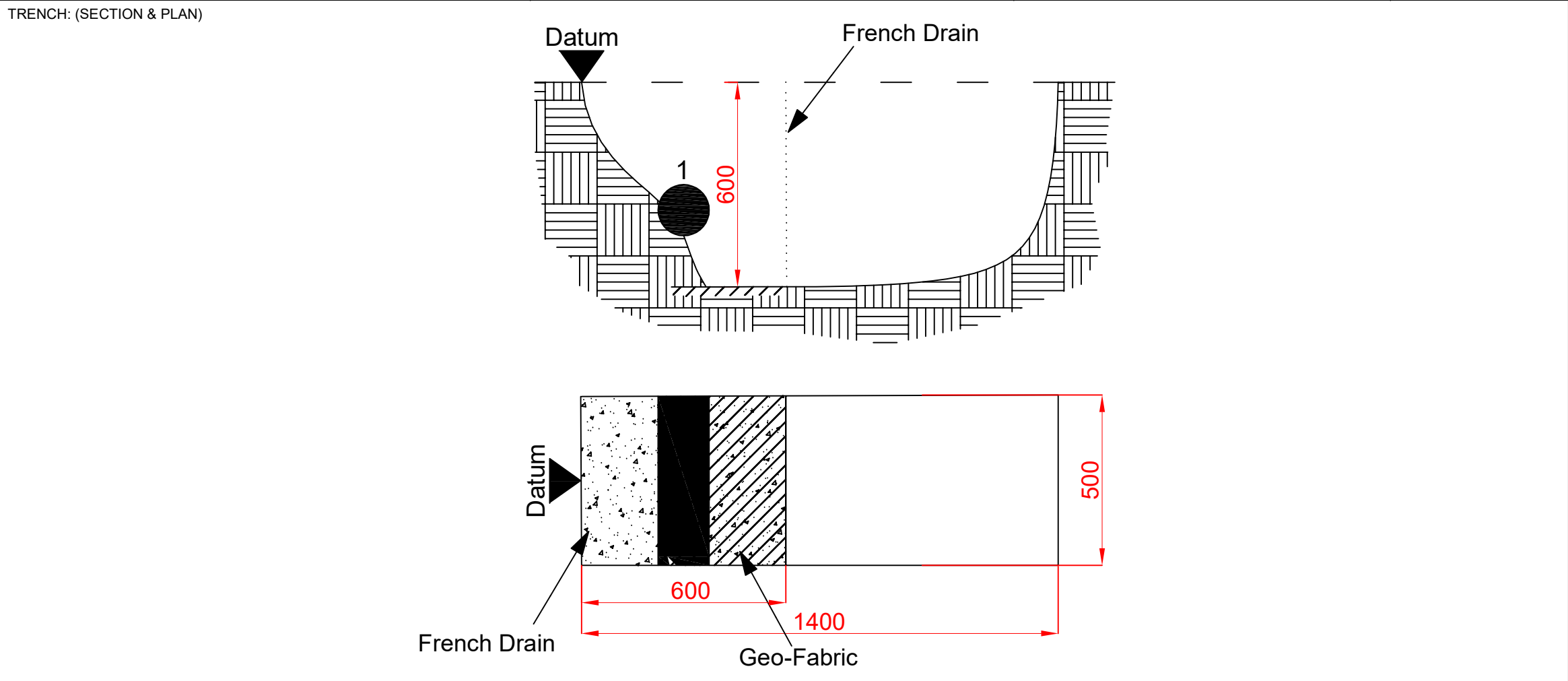
LOCATION:WP03-TP04C

CLIENT:Dublin Array

CLIENTS REPRESENTATIVE:GDG

CREW:RS

PLANT & EQUIPMENT3 Tonne Excavator & Hand Tools



COORDINATES: DATUM

EASTING: 720587.52

NORTHING: 724184.92

ELEVATION: 88.76

TRENCH LENGTH (m): 1.40

TRENCH DEPTH (m): 0.60

TRENCH WIDTH (m): 0.50

STABILITY: GOOD

GROUNDWATER: NONE

SCALE: NTS@A3

DRAWN: MD

CHECKED: SR

DATE EXCAVATED: 10/10/2023

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Unknown	150	0.30	0.30	150mm ribbed PVC black
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					





Project Name:
Dublin Array Onshore Cable Route

Trial Pit ID

WP03_TP05

Coordinates
720962.99 E
724004.87 N

Client:
Dublin Array

Client's Representative:
Gavin & Doherty Geosolutions (GDG)

Sheet 1 of 1
Scale: 1:25


Elevation
37.29 mOD




Date:
11/09/2023

Logger:
RS

FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
0.50 0.50 - 0.50	B2 ES1					MADE GROUND: Reworked stiff brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse.	
			86.39	0.90		MADE GROUND: Reworked brown gravelly very clayey fine to coarse SAND with low cobble content. Gravel is subrounded fine to coarse. Cobbles are subrounded	
			85.59	1.70		End of trial pit at 1.70m	

Water Strikes		Depth: 1.70 Width: 0.50 Length: 9.90	Remarks: No LDPE liner encountered. No groundwater encountered.		
Struck at (m)	Remarks				
		Stability: Unstable	Termination Reason Terminated on engineer's instruction.	Last Updated 06/02/2024	

<div><div>CAUSEWAY GEOTECH</div></div>			Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Trial Pit ID WP03_TP06				
			Coordinates 720942.60 E 723869.21 N		Client: Dublin Array Client's Representative: Gavin & Doherty Geosolutions (GDG)			Sheet 1 of 1 Scale: 1:25				
Method: Slit Trenching			Elevation 89.39 mOD		Date: 11/09/2023			Logger: RS		FINAL		
Plant: 3t Tracked Excavator												
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description				Water		
0.30	ES1		88.99	0.40		MADE GROUND: Stiff brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.						
						End of trial pit at 0.40m					0.5	
											1.0	
											1.5	
											2.0	
											2.5	
											3.0	
											3.5	
											4.0	
											4.5	
Water Strikes			Depth: 0.40		Remarks: LDPE Liner exposed. No groundwater encountered.							
Struck at (m)		Remarks		Width: 0.50								
				Length: 2.80								
			Stability: Unstable		Termination Reason Terminated at scheduled depth.				Last Updated 06/02/2024			

JOB NUMBER:23-0343

JOB NAME:Dublin Array Onshore Cable Route

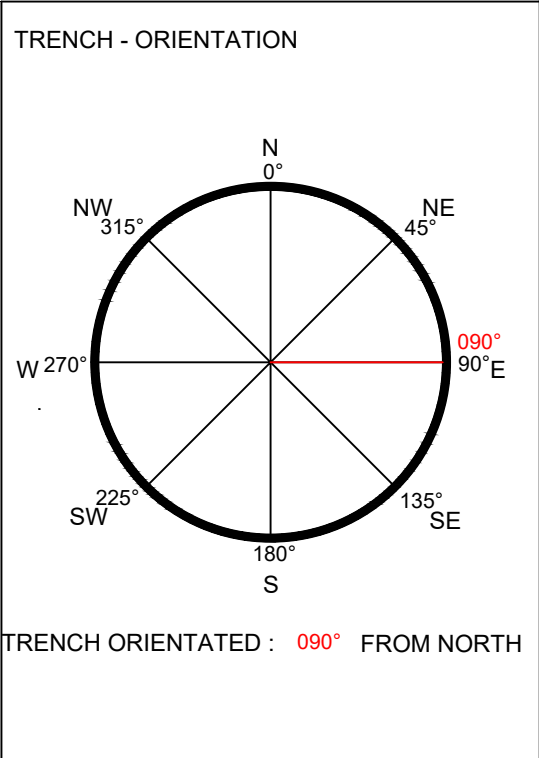
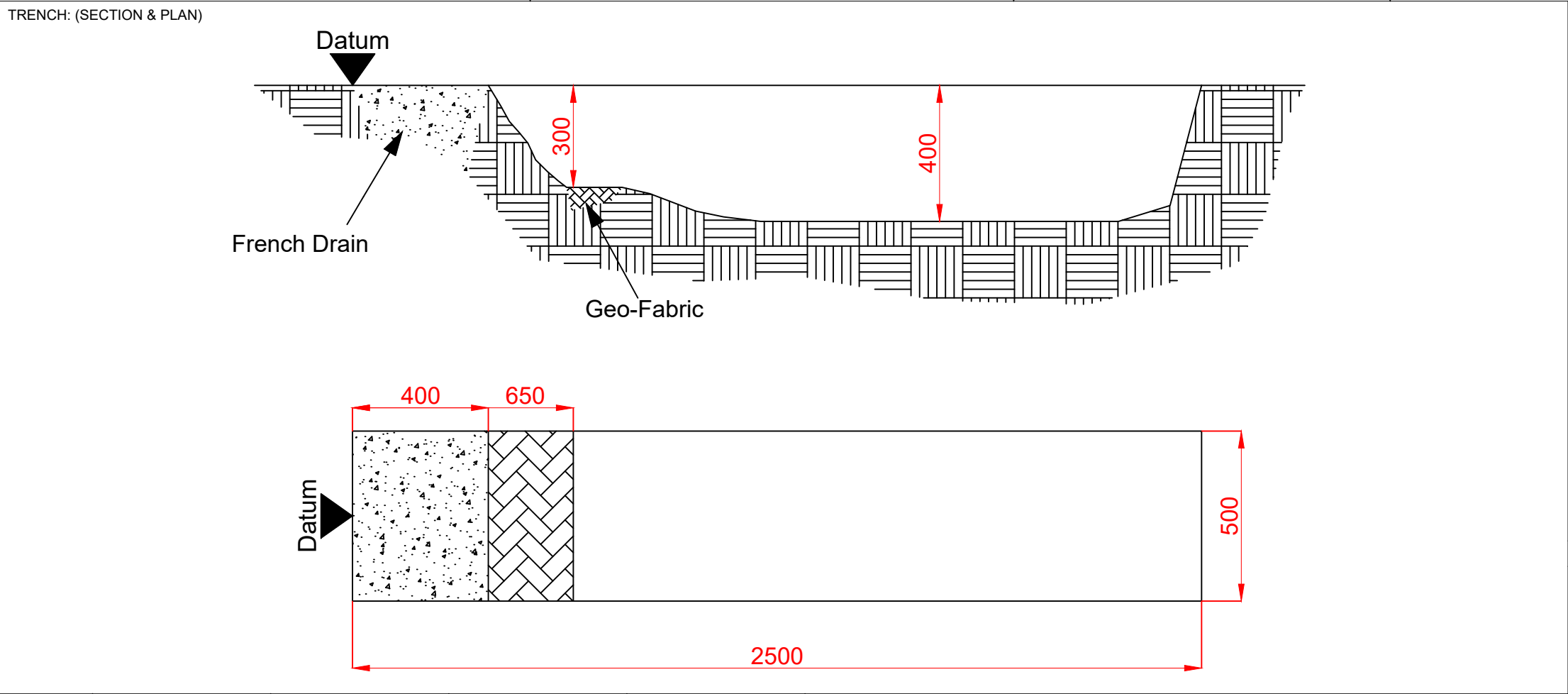
LOCATION:WP03-TP06

CLIENT:Dublin Array

CLIENTS REPRESENTATIVE:GDG

CREW:RS

PLANT & EQUIPMENT3 Tonne Excavator & Hand Tools



COORDINATES: DATUM

EASTING: 720942.60
NORTHING: 723869.21
ELEVATION: 89.39

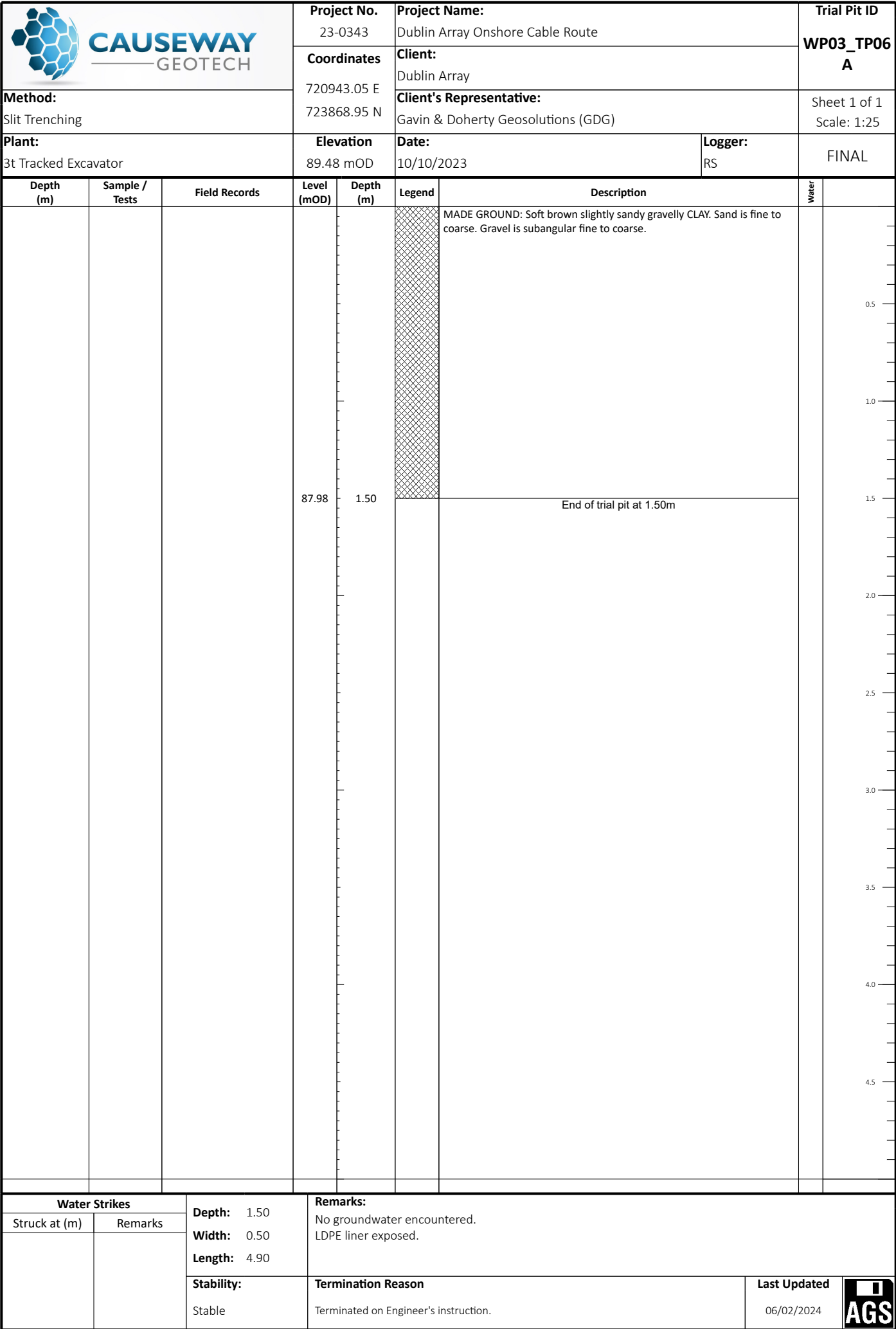
TRENCH LENGTH (m): 2.50
TRENCH DEPTH (m): 0.40
TRENCH WIDTH (m): 0.50

STABILITY: GOOD
GROUNDWATER: NONE

SCALE: NTS@A3
DRAWN: BS
CHECKED: SR
DATE EXCAVATED: 11/09/2023

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Gasmain	150	1.00	0.72	No services found
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					





JOB NUMBER:

23-0343

JOB NAME:

Dublin Array Onshore Cable Route

LOCATION:

WP03-TP06A

CLIENT:

Dublin Array

CLIENTS REPRESENTATIVE:

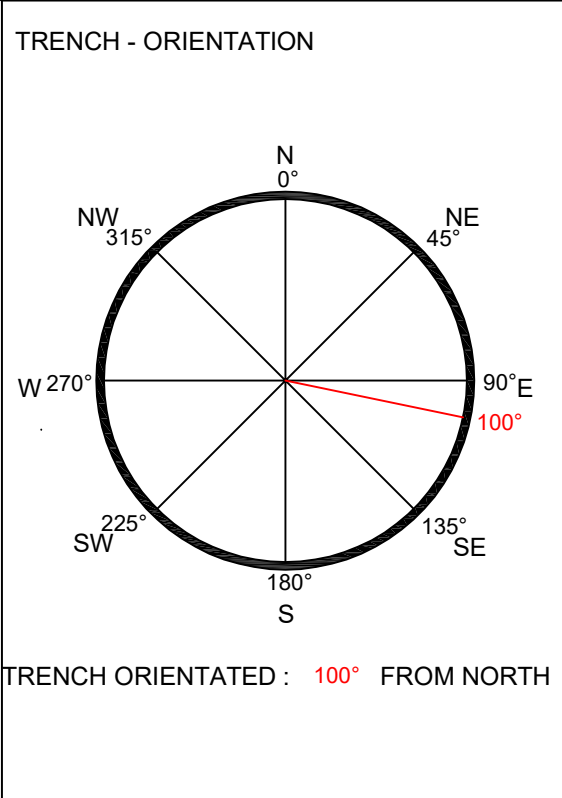
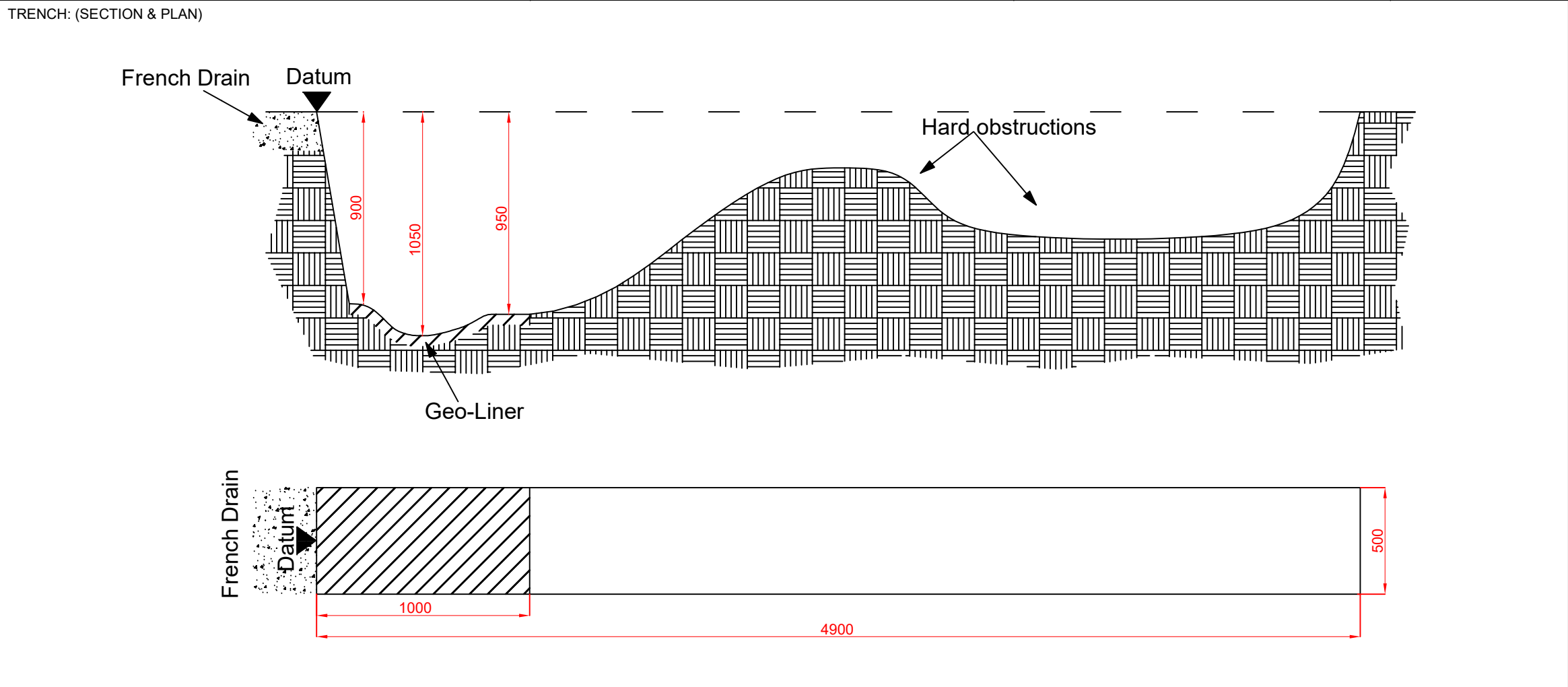
GDG

CREW:

RS

PLANT & EQUIPMENT:

3 Tonne Excavator & Hand Tools



COORDINATES: DATUM

EASTING: 720943.05
NORTHING: 723868.94
ELEVATION: 89.48




TRENCH LENGTH (m): 4.90
TRENCH DEPTH (m): 0.40
TRENCH WIDTH (m): 1.05

STABILITY: GOOD
GROUNDWATER: NONE

SCALE: NTS@A3
DRAWN: MD
CHECKED: SR
DATE EXCAVATED: 10/10/2023

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01					No services found
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					



<div><div>CAUSEWAY GEOTECH</div></div>			Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Trial Pit ID WP03_TP07				
			Coordinates 720918.67 E 723714.11 N		Client: Dublin Array Client's Representative: Gavin & Doherty Geosolutions (GDG)			Sheet 1 of 1 Scale: 1:25				
Method: Slit Trenching			Elevation 90.34 mOD		Date: 11/09/2023			Logger: RS		FINAL		
Plant: 3t Tracked Excavator												
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description				Water		
0.50 - 0.50	ES1		89.84	0.50		MADE GROUND: Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.					0.5	
						End of trial pit at 0.50m						
											1.0	
											1.5	
											2.0	
											2.5	
											3.0	
											3.5	
											4.0	
											4.5	
Water Strikes			Depth: 0.50		Remarks: LDPE Liner exposed. 225m ribbed black service encountered at 0.30m. No groundwater encountered.							
Struck at (m)			Width: 0.50									
Remarks			Length: 2.00									
			Stability: Moderately stable		Termination Reason Terminated at scheduled depth.				Last Updated 06/02/2024			

JOB NUMBER:23-0343

JOB NAME:Dublin Array Onshore Cable Route

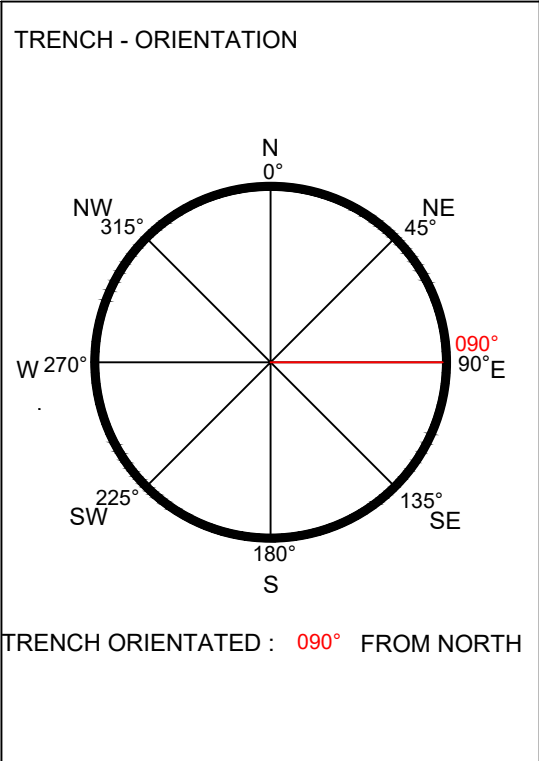
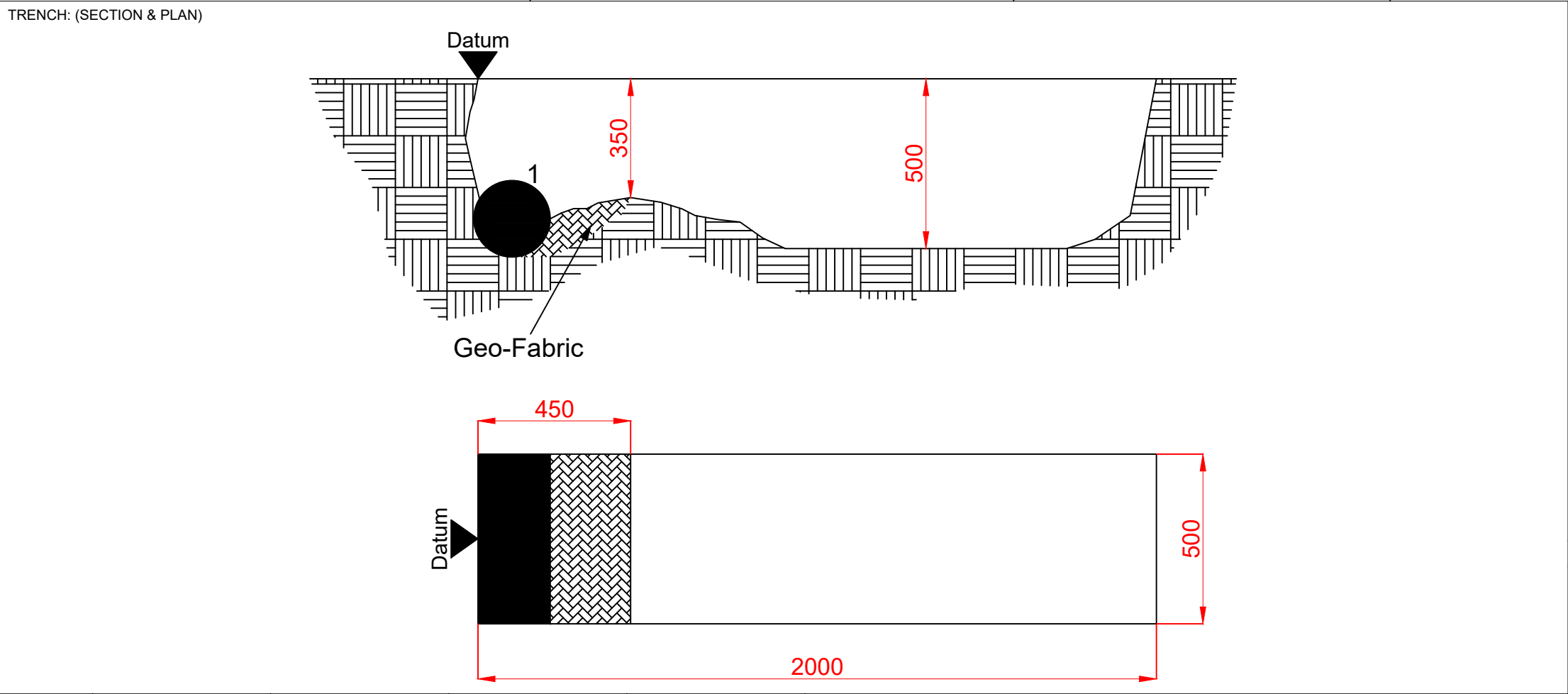
LOCATION:WP03-TP07

CLIENT:Dublin Array

CLIENTS REPRESENTATIVE:GDG

CREW:RS

PLANT & EQUIPMENT3 Tonne Excavator & Hand Tools



COORDINATES: DATUM

EASTING: 720918.67
NORTHING: 723714.11
ELEVATION: 90.34

TRENCH LENGTH (m): 2.00
TRENCH DEPTH (m): 0.50
TRENCH WIDTH (m): 0.50

STABILITY: GOOD
GROUNDWATER: NONE

SCALE: NTS@A3
DRAWN: BS
CHECKED: SR
DATE EXCAVATED: 11/09/2023

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Unknown	225	0.30	0.10	225mm Ribbed Black PVC Pipe
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					





23-0343

Dublin Array Onshore Cable Route

WP03_TP07
A

Slit Trenching

720921.21 E

Dublin Array

Gavin & Doherty Geosolutions (GDG)

Sheet 1 of 1
Scale: 1:25

3t Tracked Excavator


90.02 mOD

10/10/2023

RS

FINAL

[illegible]

Water Strikes		Depth: 0.40	Remarks:		
Struck at (m)	Remarks				
		Width: 0.40	No LDPE liner encountered.		
		Length: 1.20			
		Stability:	Termination Reason	Last Updated	
		Stable	Terminated on Engineer's instruction.	06/02/2024	

JOB NUMBER:23-0343

JOB NAME:Dublin Array Onshore Cable Route

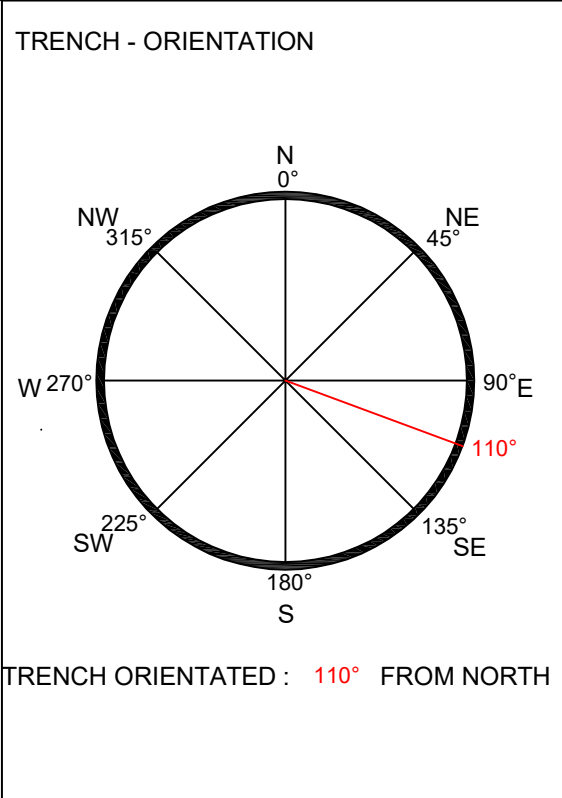
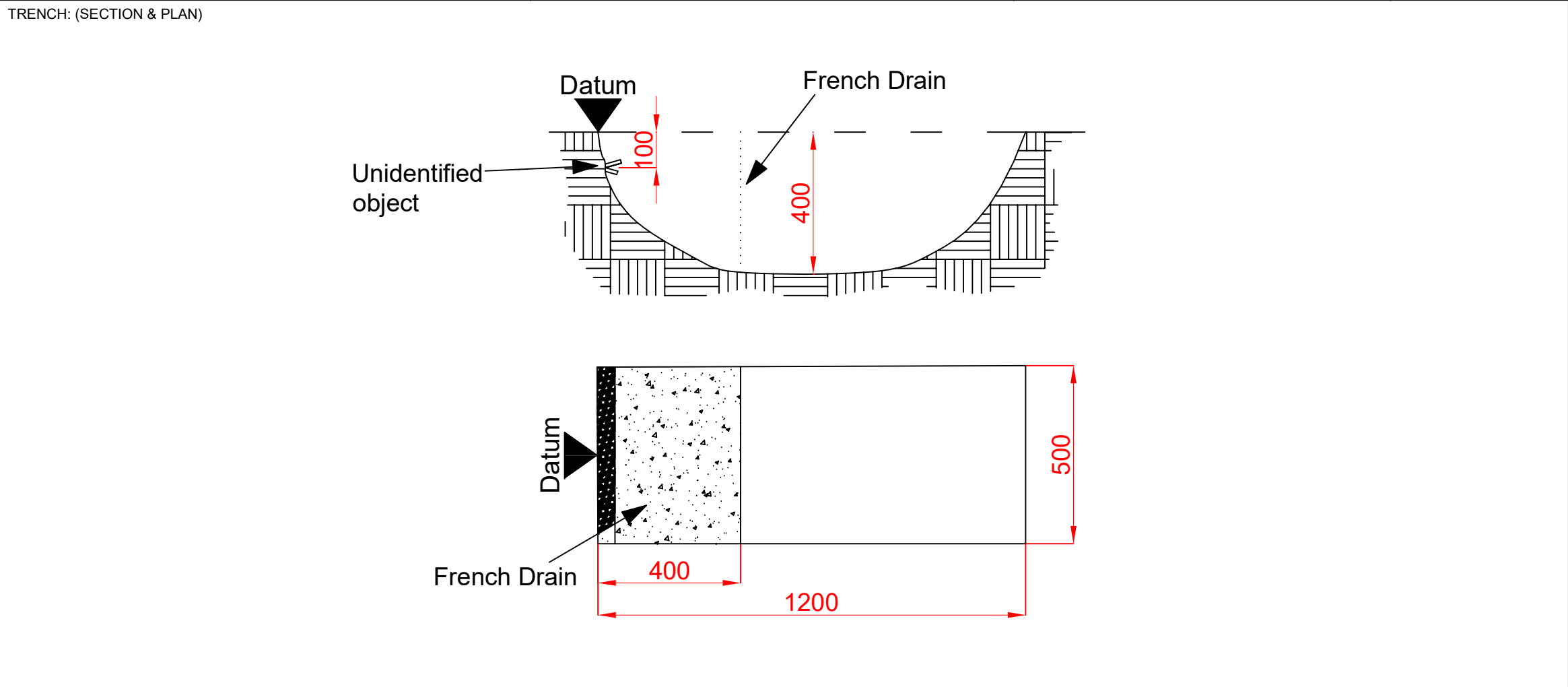
LOCATION:WP03-TP07A

CLIENT:Dublin Array

CLIENTS REPRESENTATIVE:GDG

CREW:RS

PLANT & EQUIPMENT3 Tonne Excavator & Hand Tools



COORDINATES: DATUM

EASTING: 720921.21
NORTHING: 723719.32
ELEVATION: 90.02

TRENCH LENGTH (m): 1.20
TRENCH DEPTH (m): 0.40
TRENCH WIDTH (m): 0.50

STABILITY: GOOD
GROUNDWATER: NONE

SCALE: NTS@A3
DRAWN: MD
CHECKED: SR
DATE EXCAVATED: 10/10/2023

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01					No services found
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					





23-0343

Dublin Array Onshore Cable Route

WP03_TP08

Slit Trenching

720385.95 E

724261.94 N

Dublin Array

Gavin & Doherty Geosolutions (GDG)

Scale: 1:25

3t Tracked Excavator


92.86 mOD

11/09/2023

RS

FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
0.50 - 0.50	ES1		91.51	1.35		MADE GROUND: Stiff brown slightly sandy slightly gravelly CLAY with low cobble content and rare sheets of plastic. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.	
						End of trial pit at 1.35m	

Water Strikes		Depth: 1.35 Width: 0.50 Length: 3.80	Remarks: LDPE Liner exposed. No groundwater encountered.		
Struck at (m)	Remarks				
		Stability: Moderately stable	Termination Reason Terminated at scheduled depth.	Last Updated 06/02/2024	

JOB NUMBER:

23-0343

JOB NAME:

Dublin Array Onshore Cable Route

LOCATION:

WP03-TP08

CLIENT:

Dublin Array

CLIENTS REPRESENTATIVE:

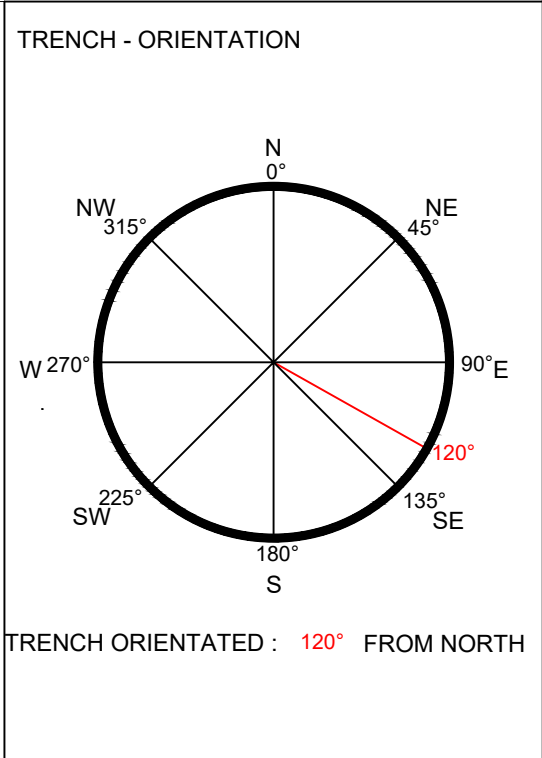
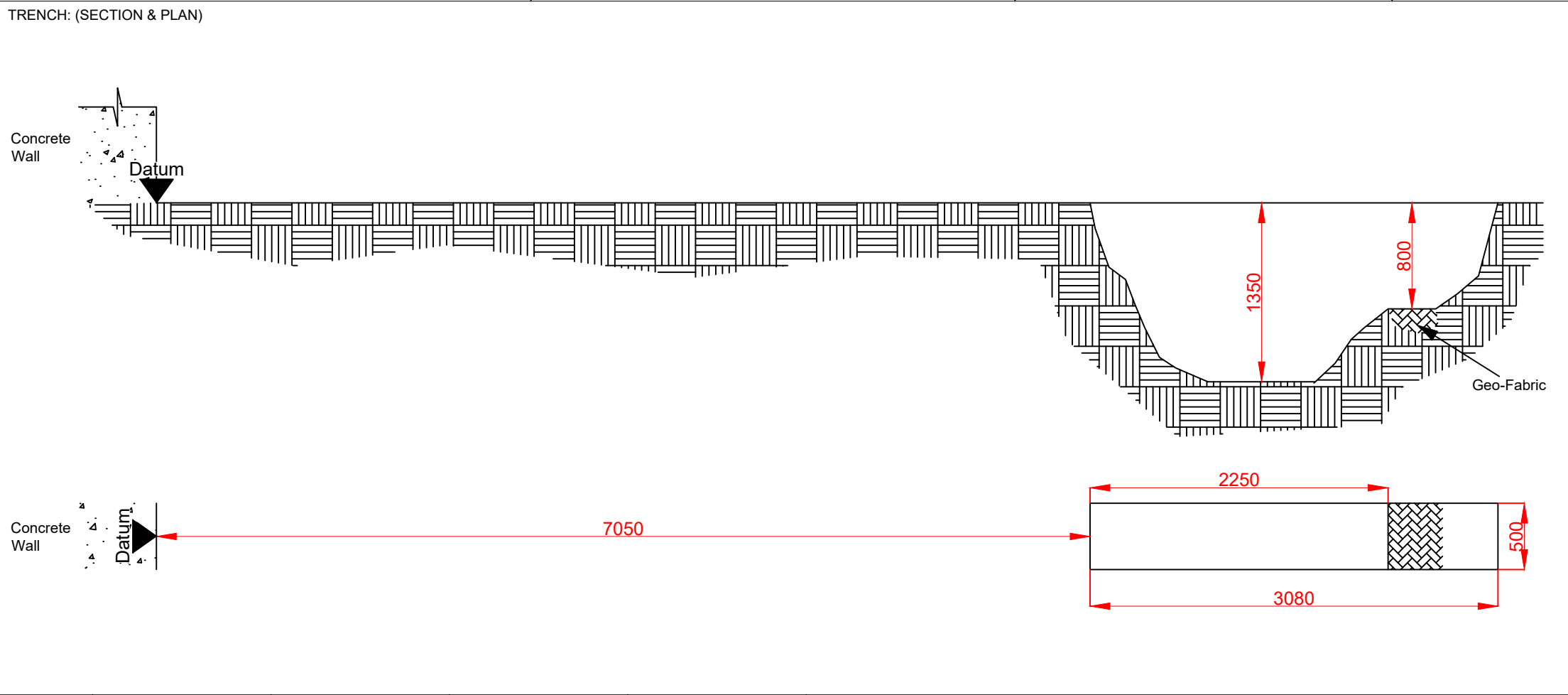
GDG

CREW:

RS

PLANT & EQUIPMENT:


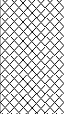



3 Tonne Excavator & Hand Tools



COORDINATES: DATUM	
EASTING:	720385.95
NORTHING:	724261.94
ELEVATION:	92.86
TRENCH LENGTH (m):	3.08
TRENCH DEPTH (m):	1.35
TRENCH WIDTH (m):	0.50
STABILITY:	GOOD
GROUNDWATER:	NONE
SCALE:	NTS@A3
DRAWN:	BS
CHECKED:	SR
DATE EXCAVATED:	11/09/2023

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Unknown	225	0.30	0.10	225mm Ribbed Black PVC Pipe
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					



<div><div>CAUSEWAY GEOTECH</div></div>			Project No. 23-0343		Project Name: Dublin Array Onshore Cable Route			Trial Pit ID WP03_TP08 A							
			Coordinates 720409.36 E 724313.09 N		Client: Dublin Array Client's Representative: Gavin & Doherty Geosolutions (GDG)			Sheet 1 of 1 Scale: 1:25							
Method: Slit Trenching			Elevation 93.17 mOD		Date: 10/10/2023			Logger: RS		FINAL					
Plant: 3t Tracked Excavator															
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description				Water					
		Slow	92.77	0.40		MADE GROUND: Firm brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse. Cobbles are subrounded.					0.5				
						MADE GROUND: Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.					1.0				
			91.92	1.25		End of trial pit at 1.25m					1.5				
											2.0				
											2.5				
											3.0				
											3.5				
											4.0				
											4.5				
<div>Water Strikes</div> <table><tr><td>Struck at (m)</td><td>Remarks</td></tr><tr><td>1.20</td><td>Slow</td></tr></table>			Struck at (m)	Remarks	1.20	Slow	<div>Depth: 1.25</div> <div>Width: 0.50</div> <div>Length: 6.50</div> <div>Stability: Stable</div>		<div>Remarks: LDPE liner exposed.</div> <div>Termination Reason: Terminated on Engineer's instruction.</div> <div>Last Updated: 06/02/2024</div> <div></div>						
Struck at (m)	Remarks														
1.20	Slow														

JOB NUMBER:23-0343

JOB NAME:Dublin Array Onshore Cable Route

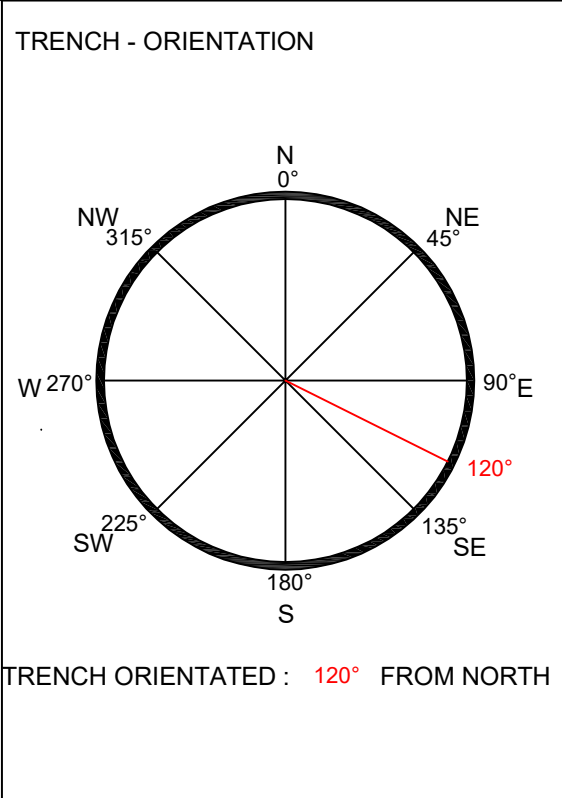
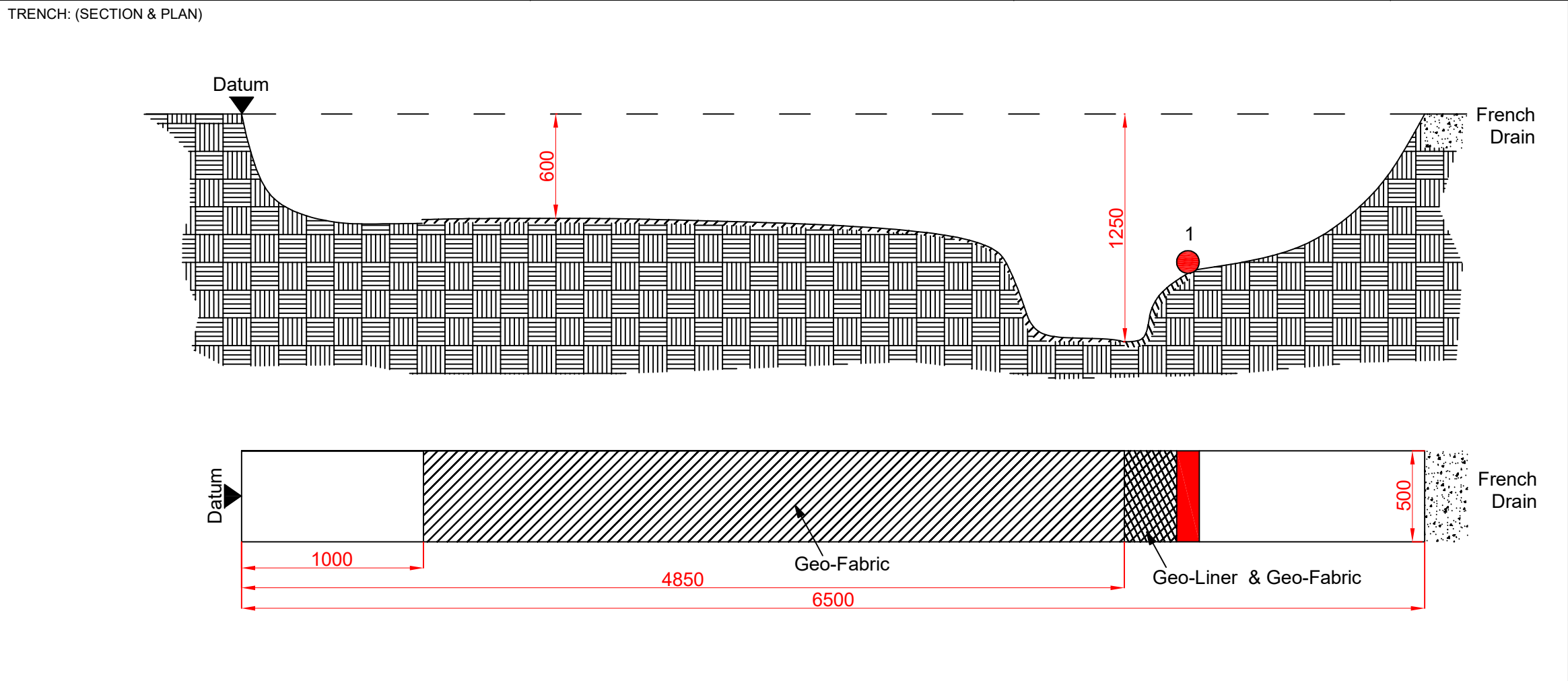
LOCATION:WP03-TP08A

CLIENT:Dublin Array

CLIENTS REPRESENTATIVE:GDG

CREW:RS

PLANT & EQUIPMENT3 Tonne Excavator & Hand Tools



COORDINATES: DATUM

EASTING: 720409.35

NORTHING: 724313.09

ELEVATION: 93.17

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Power	125	0.75	5.20	125mm red PVC
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					

TRENCH LENGTH (m): 6.50

TRENCH DEPTH (m): 0.60 - 1.25

TRENCH WIDTH (m): 0.50

STABILITY: GOOD

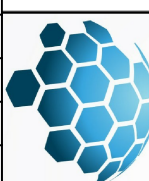
GROUNDWATER: NONE

SCALE: NTS@A3

DRAWN: MD

CHECKED: SR

DATE EXCAVATED: 10/10/2023

**CAUSEWAY**
GEOTECH



Project Name:
Dublin Array Onshore Cable Route

Trial Pit ID

WP03_TP09

Coordinates
720958.36 E
723984.69 N

Client:
Dublin Array

Client's Representative:
Gavin & Doherty Geosolutions (GDG)

Sheet 1 of 1
Scale: 1:25


Elevation
38.15 mOD

Date:
12/09/2023

Logger:
RS

FINAL

[illegible]

Water Strikes		Depth: 2.00 Width: 0.50 Length: 3.80	Remarks: No LDPE Liner encountered. 50mm ribbed black service encountered at 0.30m. No groundwater encountered.		
Struck at (m)	Remarks				
		Stability: Moderately stable	Termination Reason Terminated at scheduled depth.	Last Updated 06/02/2024	

JOB NUMBER:23-0343

JOB NAME:Dublin Array Onshore Cable Route

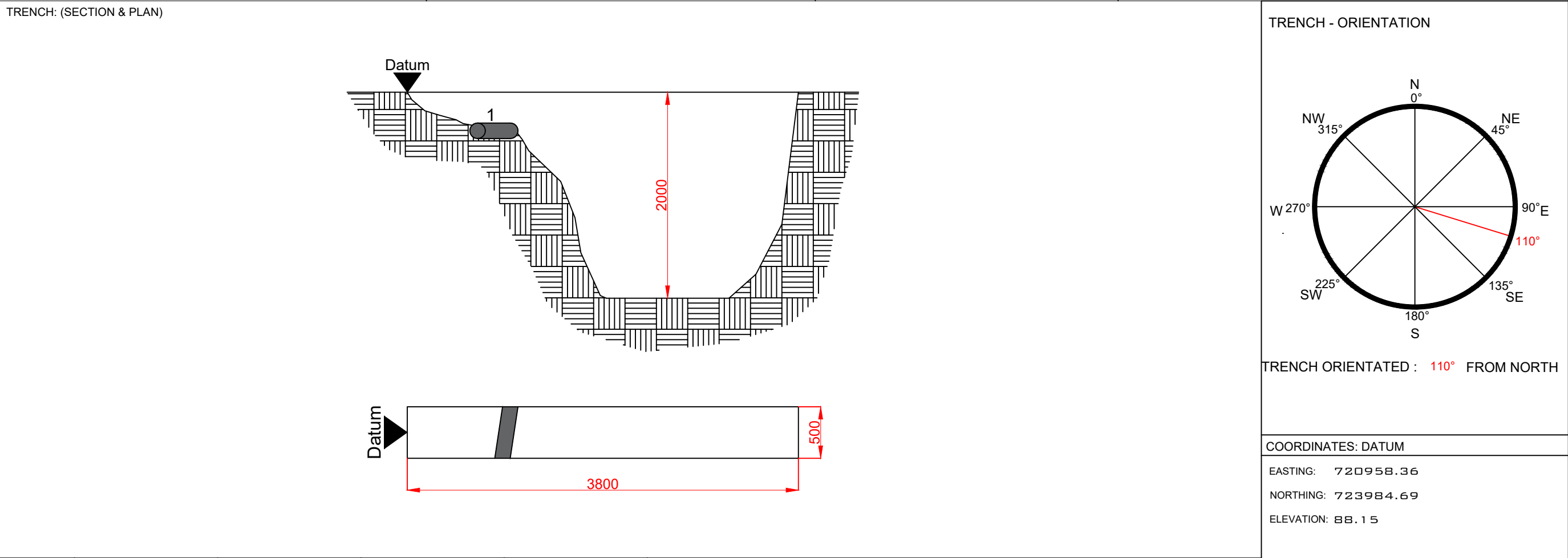
LOCATION:WP03-TP09

CLIENT:Dublin Array

CLIENTS REPRESENTATIVE:GDG

CREW:RS

PLANT & EQUIPMENT3 Tonne Excavator & Hand Tools



No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Unknown	150	0.30	1.00	150mm Ribbed PVC Pipe
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					

TRENCH LENGTH (m) : 3.80

TRENCH DEPTH (m) : 2.00

TRENCH WIDTH (m) : 0.50

STABILITY: GOOD


GROUNDWATER: NONE

SCALE: NTS@A3

DRAWN: BS

CHECKED: SR

DATE EXCAVATED: 12/09/2023





CAUSEWAY
— GEOTECH

APPENDIX E
TRIAL PIT AND SLIT TRENCH
PHOTOGRAPHS





WP03_TP01



WP03_TP01



WP03_TP01



WP03_TP01



WP03_TP01



WP03_TP01



WP03_TP01



WP03_TP01



WP03_TP01



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP02



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP03



WP03_TP04



WP03_TP04



WP03_TP04



WP03_TP04



WP03_TP04



WP03_TP04A



WP03_TP04A



WP03_TP04A



WP03_TP04A



WP03_TP04B



WP03_TP04B



WP03_TP04B



WP03_TP04C



WP03_TP04C



WP03_TP04C



WP03_TP04C



WP03_TP04C



WP03_TP05



WP03_TP05



WP03_TP05



WP03_TP05



WP03_TP05



WP03_TP06



WP03_TP06



WP03_TP06



WP03_TP06



WP03_TP06A



WP03_TP06A



WP03_TP06A



WP03_TP06A



WP03_TP06A



WP03_TP07



WP03_TP07



WP03_TP07



WP03_TP07



WP03_TP07



WP03_TP07



WP03_TP07A



WP03_TP07A



WP03_TP07A



WP03_TP07A



WP03_TP07A



WP03_TP08



WP03_TP08



WP03_TP08



WP03_TP08



WP03_TP08



WP03_TP08



WP03_TP08A



WP03_TP08A



WP03_TP08A



WP03_TP08A



WP03_TP08A



WP03_TP08A



WP03_TP08A



WP03_TP09



WP03_TP09



WP03_TP09



WP03_TP09



WP03_TP09



CAUSEWAY
— GEOTECH

APPENDIX F
GEOTECHNICAL LABORATORY TEST RESULTS





LABORATORY REPORT



Contract Number: PSL23/8486

Report Date: 25 October 2023
Client's Reference: 23-0343
Client Name: Causeway Geotech
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route

Date Received: 6/10/2023
Date Commenced: 6/10/2023
Date Completed: 25/10/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Dublin Array Onshore Cable Route

Contract No:

PSL23/8486

Client Ref:

23-0343

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

[illegible]

Dublin Array Onshore Cable Route

Contract No:

PSL23/8486

Client Ref:

23-0343

PSLRF021

Issue No.1

Approved by: L Pavey

03/01/2023

**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT****28 November
2023**

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

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 17/10/2023 and 28/11/2023.

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**

Project Name: Dublin Array Onshore Cable Route

Report Reference: Schedule 2 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	3
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	2
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	4
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	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
SOIL – subcontracted to Pro Soils Limited (<i>UKAS 4043</i>)	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377-4: 1990: Cl 3.3 & 3.4	1
SOIL – subcontracted to Pro Soils Limited (<i>UKAS 4043</i>)	Thermal Conductivity / Resistivity (1- point test at optimum moisture content)	ASTM D5334	1



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

Key			Date Printed	Approved By	 10122
Density test	Liquid Limit	Particle density	13/11/2023		
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				
				Stephen Watson	

PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH01

Site Name

Dublin Array Onshore Cable Route

Sample No.

5

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top
Base

0.20
1.20

Specimen Reference

2

Specimen
Depth

0.2

m

Sample Type

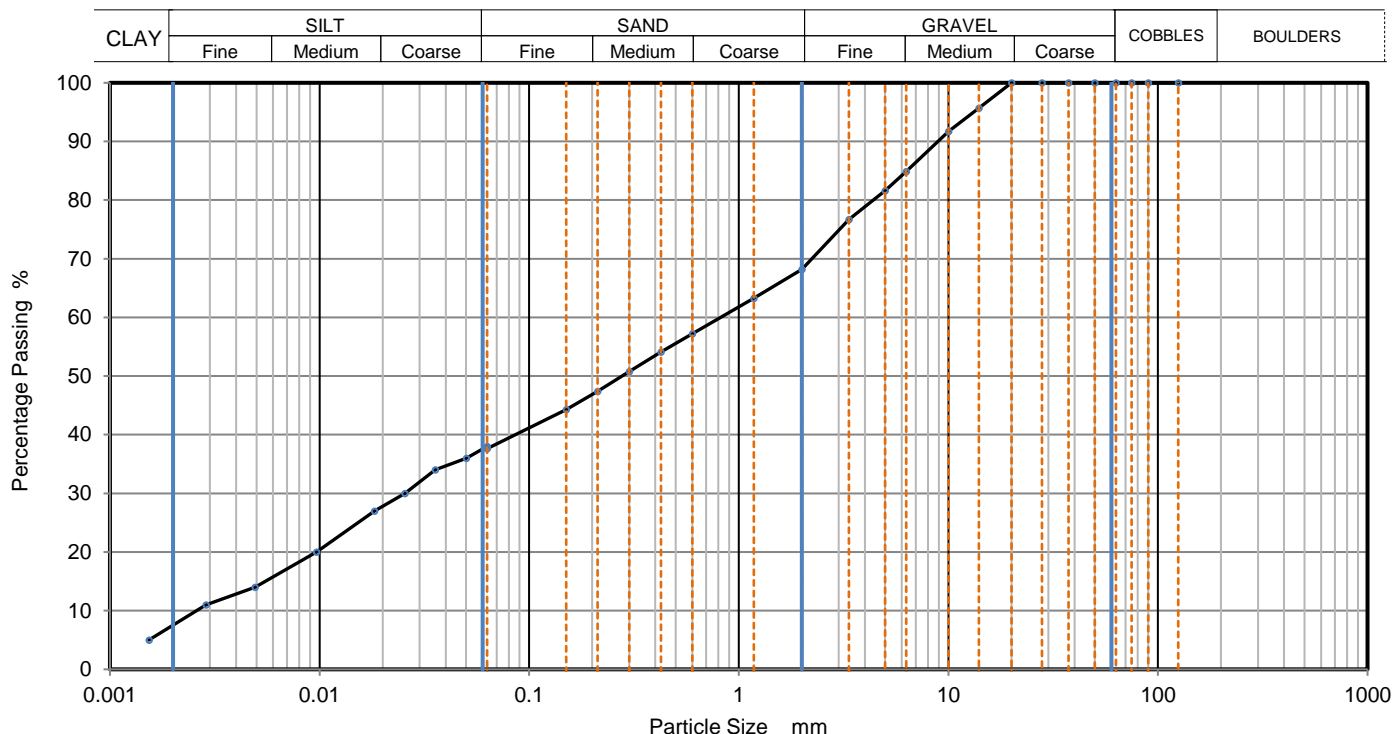
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus2023101742



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	38
90	100	0.05010	36
75	100	0.03565	34
63	100	0.02553	30
50	100	0.01827	27
37.5	100	0.00966	20
28	100	0.00491	14
20	100	0.00287	11
14	96	0.00153	5
10	92		
6.3	85		
5	82		
3.35	77		
2	68		
1.18	63		
0.6	57		
0.425	54	Particle density (assumed)	
0.3	51	2.65	Mg/m3
0.212	47		
0.15	44		
0.063	38		

Dry Mass of sample, g

522

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	31.8
Sand	30.6
Silt	30.0
Clay	7.6

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	310
Curvature Coefficient	0.28

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved

Stephen Watson



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH01

Site Name

Dublin Array Onshore Cable Route

Sample No.

7

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

1.20

Base

2.00

Specimen Reference

2

Specimen
Depth

1.2

m

Sample Type

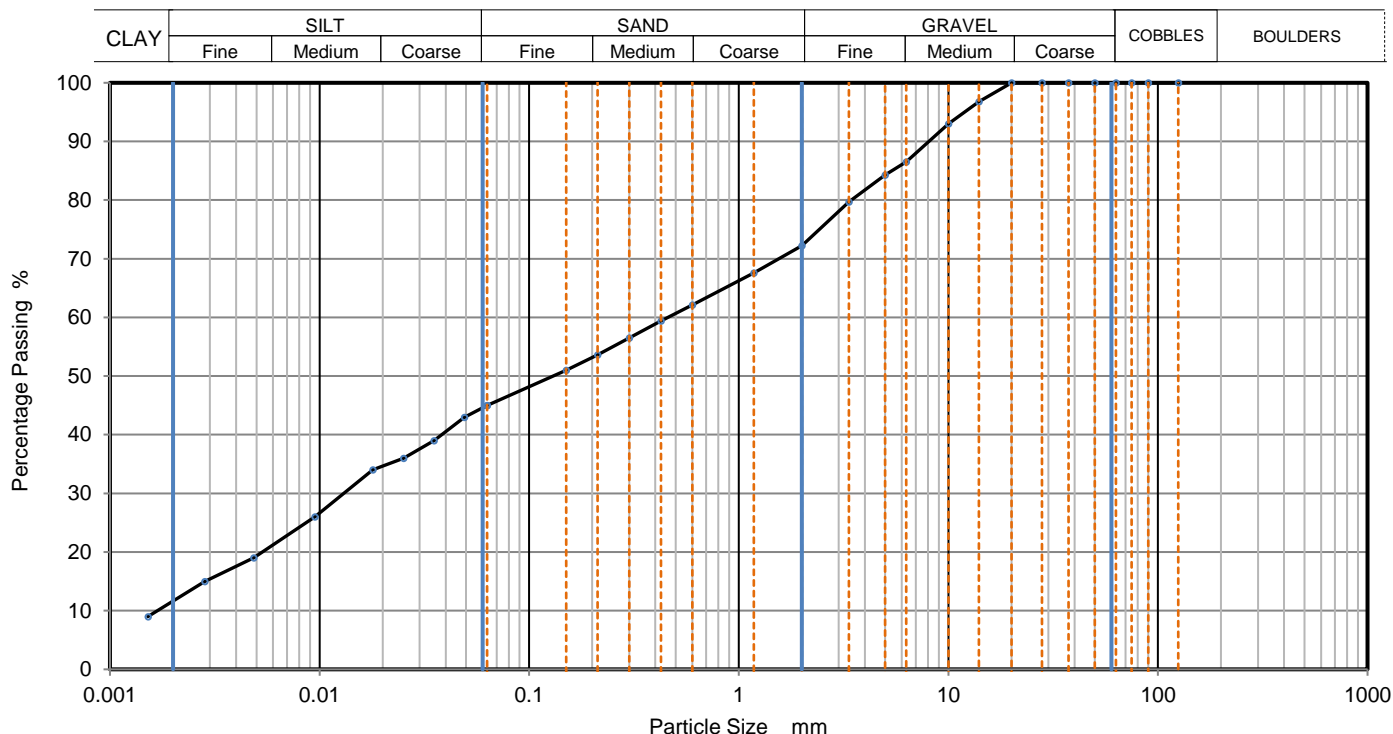
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus2023101744



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	45
90	100	0.04912	43
75	100	0.03519	39
63	100	0.02521	36
50	100	0.01794	34
37.5	100	0.00949	26
28	100	0.00486	19
20	100	0.00284	15
14	97	0.00152	9
10	93		
6.3	87		
5	84		
3.35	80		
2	72		
1.18	68		
0.6	62	Particle density (assumed) 2.65 Mg/m ³	
0.425	59		
0.3	57		
0.212	54		
0.15	51		
0.063	45		

Dry Mass of sample, g

524

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	27.8
Sand	27.2
Silt	33.1
Clay	11.9

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	280
Curvature Coefficient	0.23

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below

Approved

Stephen Watson

LAB 05R - Version 6



10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH01

Site Name

Dublin Array Onshore Cable Route

Sample No.

11

Specimen Description

Grey slightly sandy slightly clayey subangular fine to coarse GRAVEL.

Sample
Depth (m)

Top

3.00

Base

3.80

Specimen Reference

2

Specimen
Depth

3

m

Sample Type

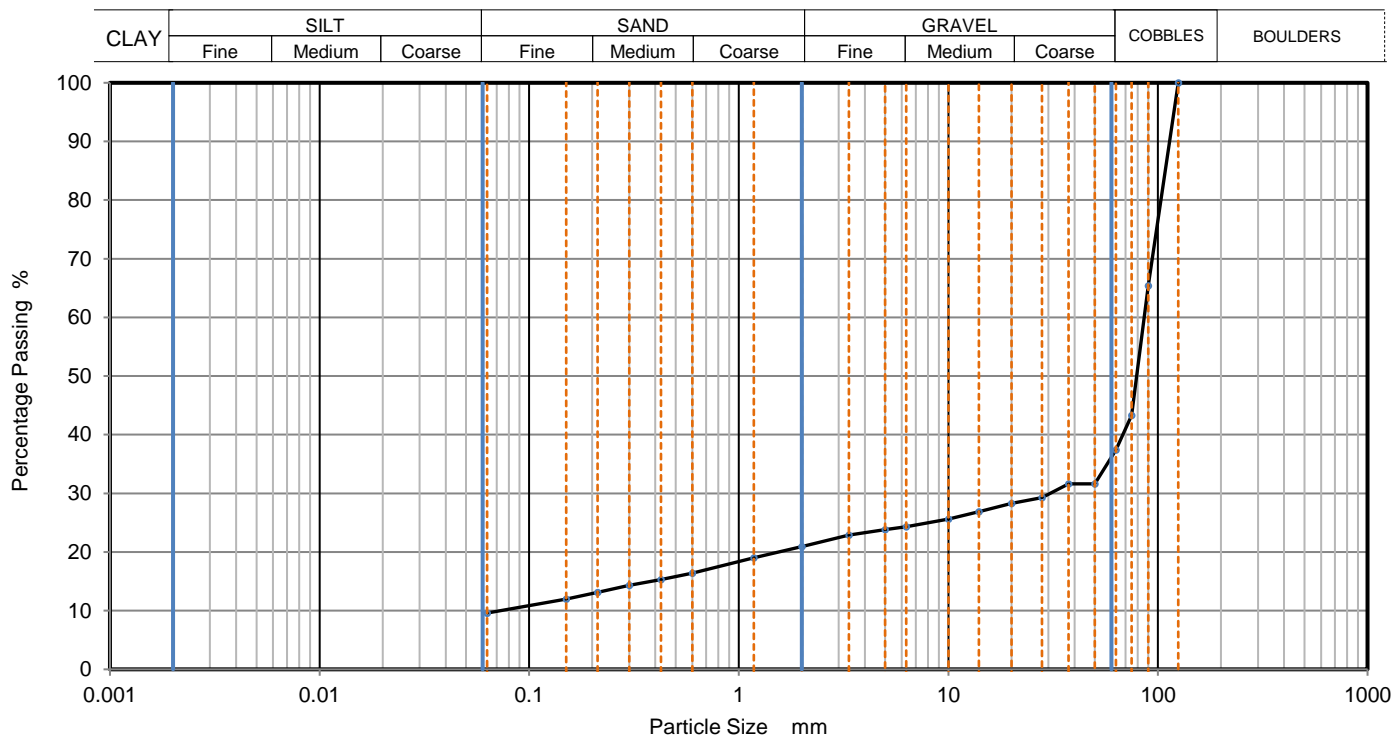
B

Test Method

BS1377:Part 2:1990, clause 9.2

KeyLAB ID

Caus2023101747



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	65		
75	43		
63	37		
50	32		
37.5	32		
28	29		
20	28		
14	27		
10	26		
6.3	24		
5	24		
3.35	23		
2	21		
1.18	19		
0.6	16		
0.425	15		
0.3	14		
0.212	13		
0.15	12		
0.063	10		

Dry Mass of sample, g

8483

Sample Proportions	% dry mass
Cobbles	62.6
Gravel	16.5
Sand	11.4
Fines <0.063mm	10.0

Grading Analysis	
D100	mm 125
D60	mm 86.1
D30	mm 30.6
D10	mm 0.0736
Uniformity Coefficient	1200
Curvature Coefficient	150

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH13

Site Name

Dublin Array Onshore Cable Route

Sample No.

3

Specimen Description

Brown slightly gravelly slightly silty fine to coarse SAND.

Sample
Depth (m)Top
Base0.20
1.20

Specimen Reference

2

Specimen
Depth

0.2

m

Sample Type

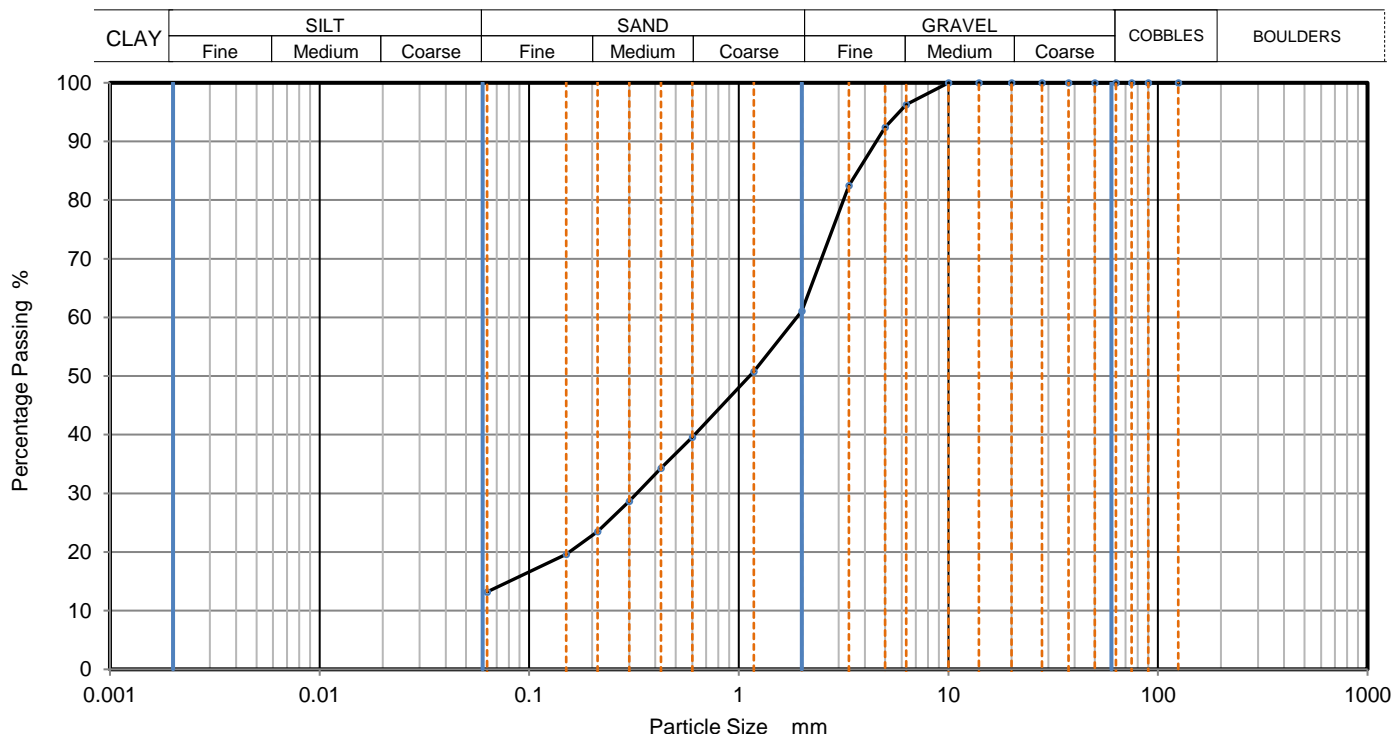
B

Test Method

BS1377:Part 2:1990, clause 9.2

KeyLAB ID

Caus2023101748



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	96		
5	92		
3.35	83		
2	61		
1.18	51		
0.6	40		
0.425	34		
0.3	29		
0.212	24		
0.15	20		
0.063	13		

Dry Mass of sample, g

304

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	38.9
Sand	47.9
Fines <0.063mm	13.0

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

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



LABORATORY REPORT



Contract Number: PSL23/9060

Report Date: 28 November 2023
Client's Reference: 23-0343
Client Name: Causeway Geotech
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route

Date Received: 25/10/2023
Date Commenced: 25/10/2023
Date Completed: 28/11/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

5 – 7 Hexthorpe Road,
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DN4 0AR
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awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Dublin Army Onshore Cable Route

Contract No:

PSL23/9060

Client Ref:

23-0343

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.3 : 1990

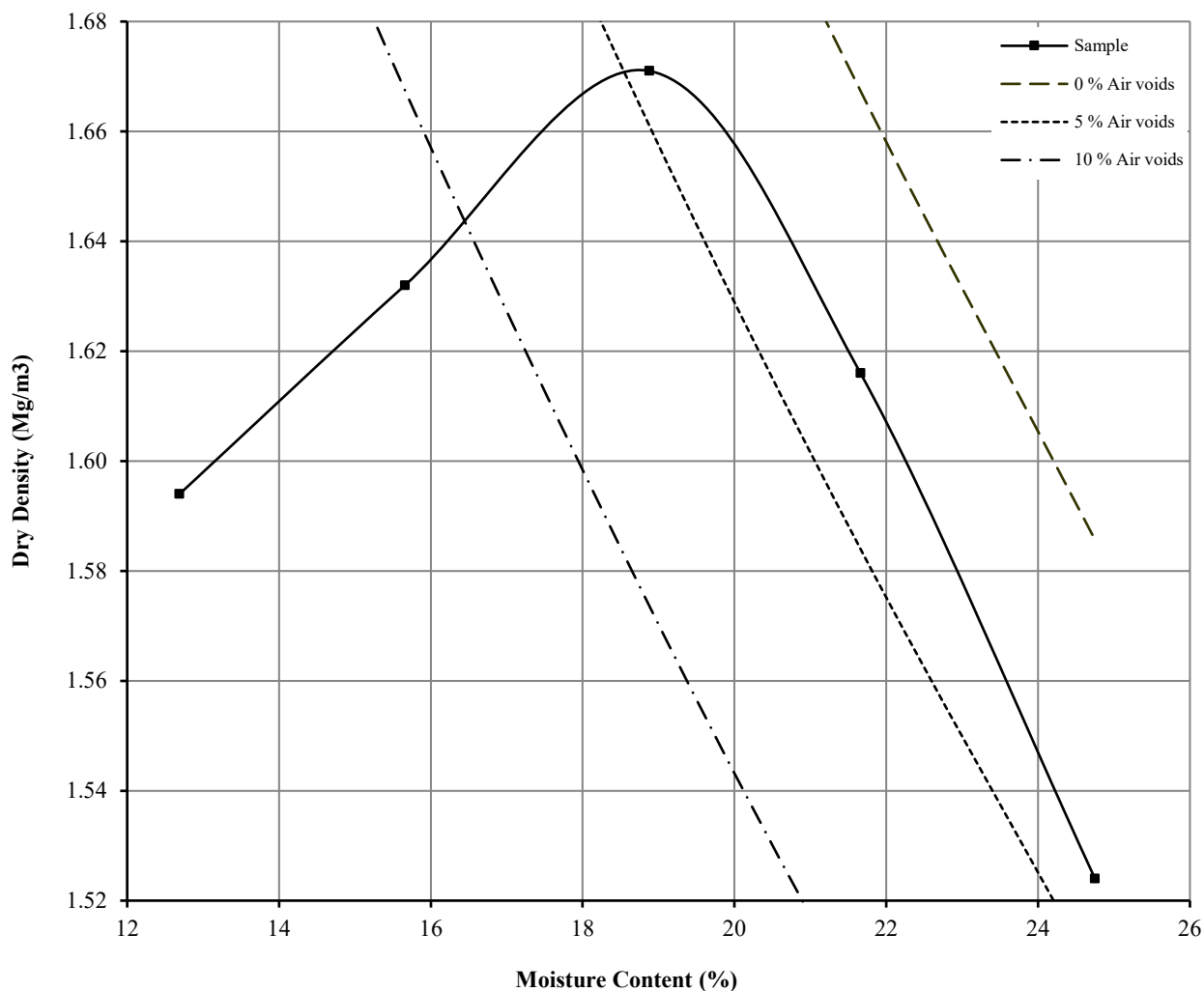
Hole Number: WP03_BH13

Top Depth (m) : 0.20

Sample Number: 7

Base Depth (m) : 1.20

Sample Type: B



Initial Moisture Content:	25	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m ³):	2.61	Assumed	Material Retained on 37.5 mm Test Sieve (%):	0
Maximum Dry Density (Mg/m ³):	1.67		Material Retained on 20.0 mm Test Sieve (%):	1
Optimum Moisture Content (%):	19			
Remarks See summary of soil descriptions				

 4043	 A PHENNA GROUP COMPANY	Dublin Army Onshore Cable Route	Contract
			PSL23/9060
			Client Ref
			23-0343

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

[illegible]

Dublin Army Onshore Cable Route

Contract No:

PSL23/9060

Client Ref:

23-0343

PSLRF021

Issue No.1

Approved by: L Pavey

03/01/2023

**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT****28 November
2023**

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

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 17/10/2023 and 28/11/2023.

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**

Project Name: Dublin Array Onshore Cable Route

Report Reference: Schedule 3 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	11
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	6
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	5
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	5

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 Pro Soils Limited (<i>UKAS 4043</i>)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	2
SOIL – subcontracted to Pro Soils Limited (<i>UKAS 4043</i>)	Thermal Conductivity / Resistivity (3 Single Point tests at NMC)	ASTM D5334	2

Summary of Classification Test Results

Project No. 23-0343		Project Name Dublin Array Onshore Cable Route												
Hole No.	Sample				Specimen Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
WP03_BH02	6	0.20	1.20	B	Brown sandy slightly gravelly silty CLAY.			20						
WP03_BH02	5	2.00		D	Brown sandy slightly gravelly silty CLAY.			20	53	33 -1pt	20	13		CL
WP03_BH09	1	1.20	1.65	D	Brown sandy slightly gravelly silty CLAY.			20	64	36 -1pt	23	13		CI
WP03_BH09	15	1.20	2.00	B	Brown sandy slightly gravelly silty CLAY.			19						
WP03_BH09	16	2.00	3.00	B	Brown sandy slightly gravelly silty CLAY.			19						
WP03_BH09	12	3.00		D	Brown sandy slightly gravelly silty CLAY.			18	61	30 -1pt	18	12		CL
WP03_BH09	10	4.00	4.45	D	Brown sandy slightly gravelly silty CLAY.			19	63	28 -1pt	18	10		CL
WP03_BH09	18	4.00	5.00	B	Brown sandy slightly gravelly silty CLAY.			19						
WP03_BH09	14	5.00		D	Brown sandy slightly gravelly silty CLAY.			20	68	30 -1pt	17	13		CL
WP03_BH10	1	0.20	1.20	B	Brown sandy slightly gravelly silty CLAY.			23						
WP03_BH10	6	1.70		D	Brown slightly sandy slightly silty subangular fine to coarse GRAVEL.			2.5						

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

LAB 01R Version 6

Key

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

Date Printed

17/11/2023

Approved By

Stephen Watson



10122

PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH02

Site Name

Dublin Array Onshore Cable Route

Sample No.

6

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top
Base

0.20
1.20

Specimen Reference

4

Specimen
Depth

0.2

m

Sample Type

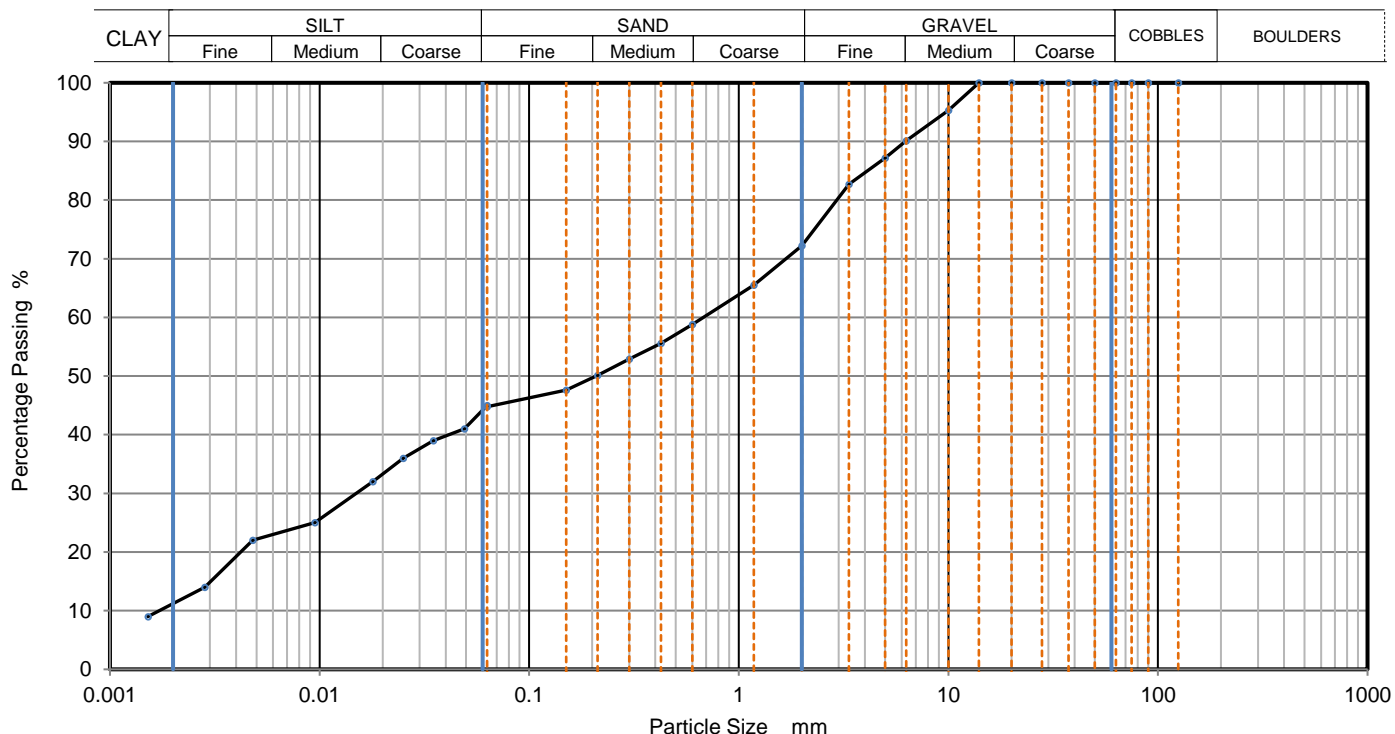
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311020



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	45
90	100	0.04912	41
75	100	0.03496	39
63	100	0.02505	36
50	100	0.01794	32
37.5	100	0.00949	25
28	100	0.00480	22
20	100	0.00284	14
14	100	0.00152	9
10	95		
6.3	90		
5	87		
3.35	83		
2	72		
1.18	66		
0.6	59		
0.425	56	Particle density (assumed)	
0.3	53	2.65	Mg/m3
0.212	50		
0.15	48		
0.063	45		

Dry Mass of sample, g

526

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	27.8
Sand	27.4
Silt	33.5
Clay	11.3

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	390
Curvature Coefficient	0.19

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved

Stephen Watson

LAB 05R - Version 6

PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH09

Site Name

Dublin Array Onshore Cable Route

Sample No.

15

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top
Base

1.20
2.00

Specimen Reference

4

Specimen
Depth

1.2

m

Sample Type

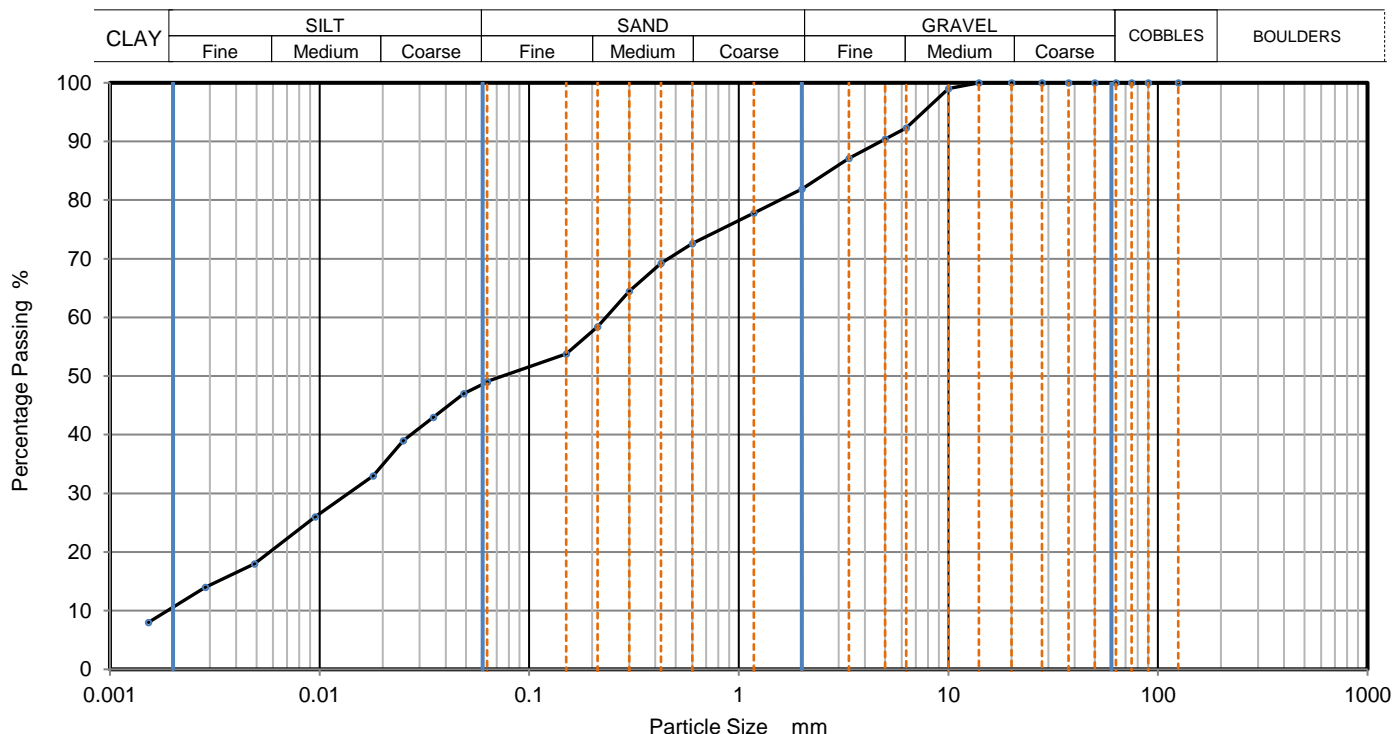
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311024



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	49
90	100	0.04879	47
75	100	0.03496	43
63	100	0.02505	39
50	100	0.01805	33
37.5	100	0.00955	26
28	100	0.00489	18
20	100	0.00285	14
14	100	0.00153	8
10	99		
6.3	92		
5	90		
3.35	87		
2	82		
1.18	78		
0.6	73		
0.425	69	Particle density (assumed)	
0.3	65	2.65	Mg/m3
0.212	58		
0.15	54		
0.063	49		

Dry Mass of sample, g

344

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	18.1
Sand	32.8
Silt	38.7
Clay	10.4

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	120
Curvature Coefficient	0.42

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved

Stephen Watson



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH09

Site Name

Dublin Array Onshore Cable Route

Sample No.

16

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

2.00

Base

3.00

Specimen Reference

4

Specimen
Depth

2

m

Sample Type

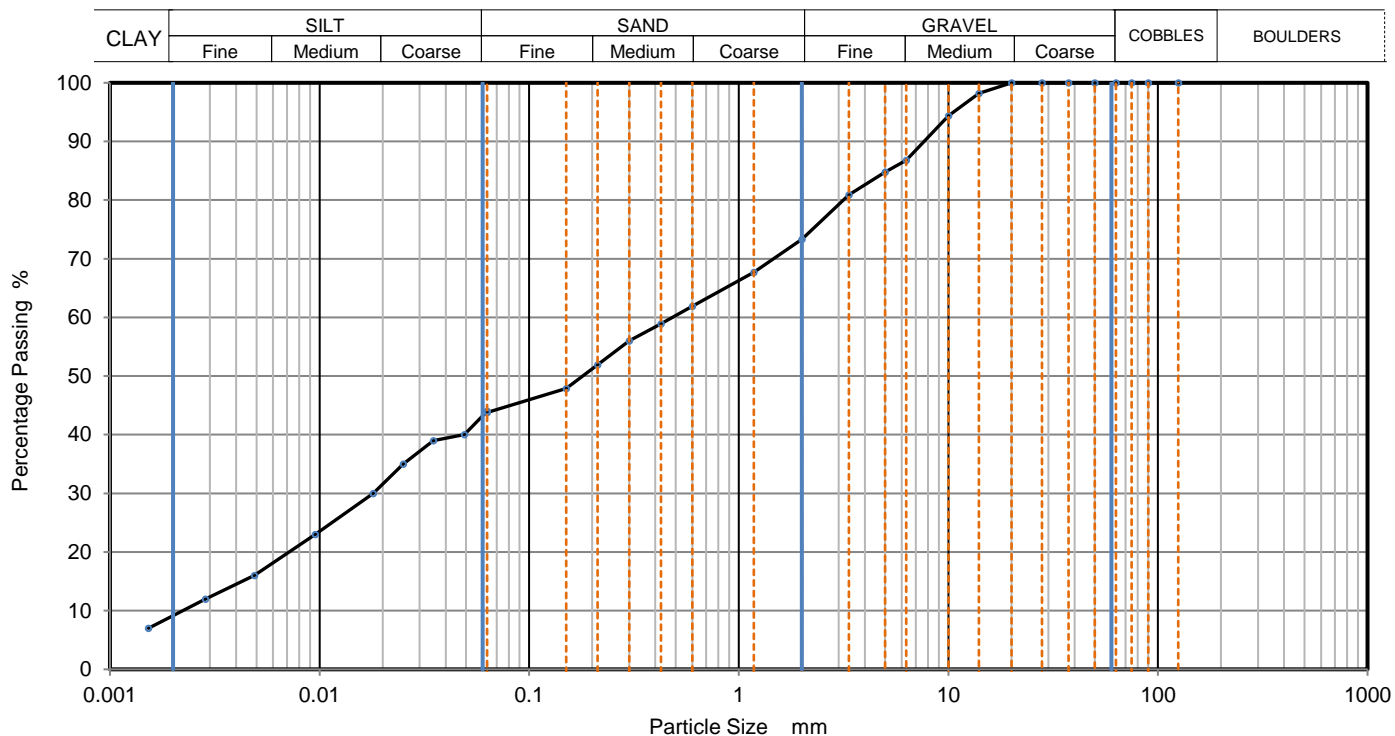
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	44
90	100	0.04912	40
75	100	0.03496	39
63	100	0.02505	35
50	100	0.01805	30
37.5	100	0.00955	23
28	100	0.00489	16
20	100	0.00285	12
14	98	0.00153	7
10	94		
6.3	87		
5	85		
3.35	81		
2	73		
1.18	68		
0.6	62	Particle density (assumed) 2.65 Mg/m ³	
0.425	59		
0.3	56		
0.212	52		
0.15	48		
0.063	44		

Dry Mass of sample, g

531

Sample Proportions

% dry mass

Cobbles	0.0
Gravel	26.7
Sand	29.5
Silt	34.5
Clay	9.3

Grading Analysis

D100	mm	
D60	mm	0.482
D30	mm	0.0183
D10	mm	0.00218
Uniformity Coefficient		220
Curvature Coefficient		0.32

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below

Approved

Stephen Watson

LAB 05R - Version 6



10122

PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH09

Site Name

Dublin Array Onshore Cable Route

Sample No.

18

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top
Base

4.00
5.00

Specimen Reference

4

Specimen
Depth

4

m

Sample Type

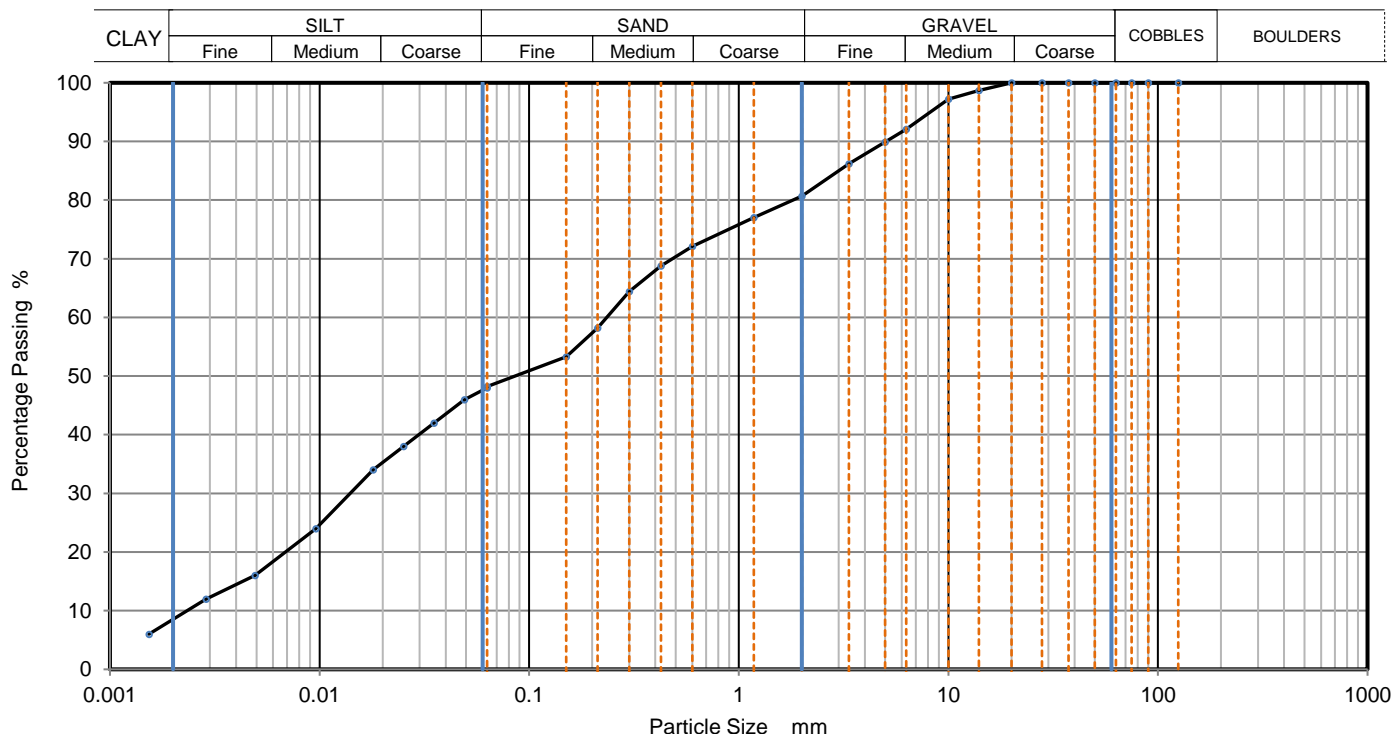
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311029



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	48
90	100	0.04912	46
75	100	0.03519	42
63	100	0.02521	38
50	100	0.01805	34
37.5	100	0.00961	24
28	100	0.00491	16
20	100	0.00287	12
14	99	0.00153	6
10	97		
6.3	92		
5	90		
3.35	86		
2	81		
1.18	77		
0.6	72		
0.425	69	Particle density (assumed) 2.65 Mg/m ³	
0.3	64		
0.212	58		
0.15	53		
0.063	48		

Dry Mass of sample, g

307

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	19.3
Sand	32.6
Silt	39.5
Clay	8.6

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	100
Curvature Coefficient	0.36

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved

Stephen Watson



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH10

Site Name

Dublin Array Onshore Cable Route

Sample No.

1

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

0.20

Base

1.20

Specimen Reference

4

Specimen
Depth

0.2

m

Sample Type

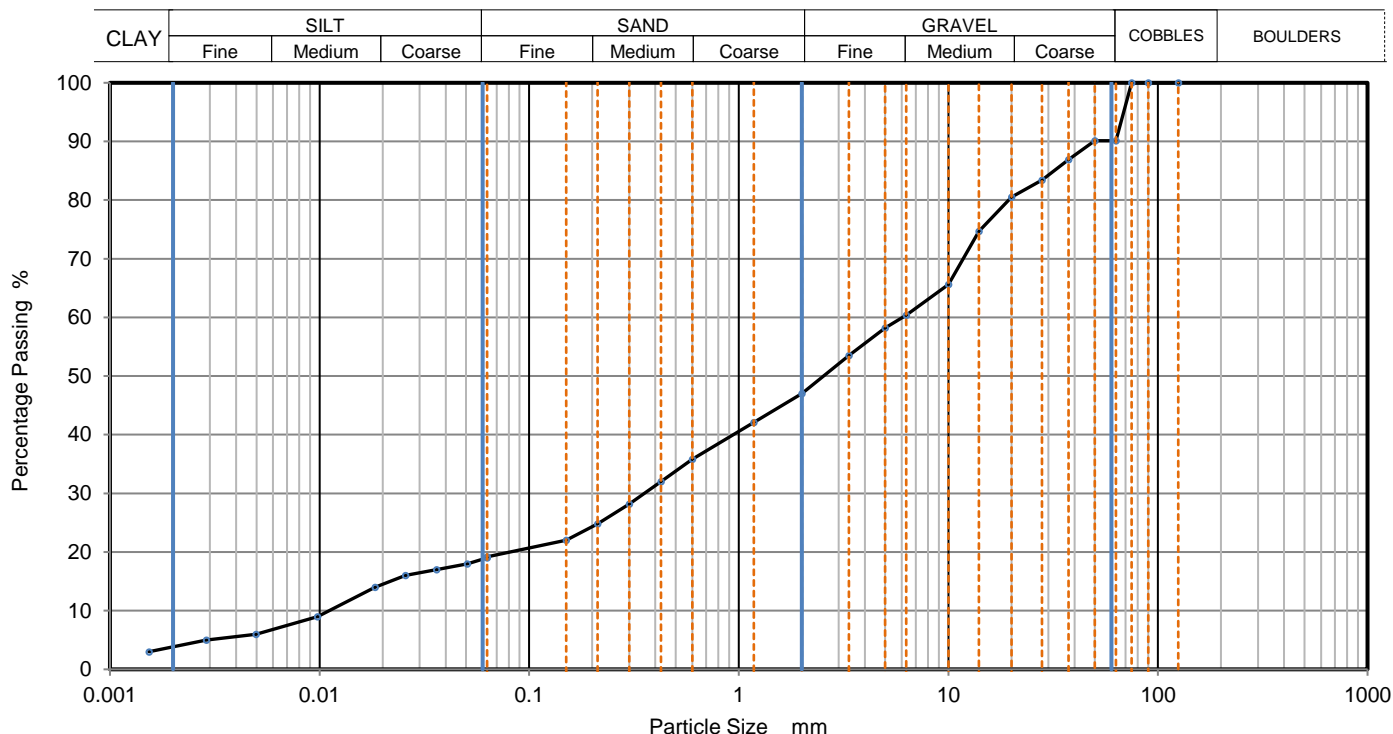
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus2023110212



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	19
90	100	0.05074	18
75	100	0.03610	17
63	90	0.02568	16
50	90	0.01838	14
37.5	87	0.00977	9
28	83	0.00497	6
20	81	0.00288	5
14	75	0.00153	3
10	66		
6.3	60		
5	58		
3.35	54		
2	47		
1.18	42		
0.6	36	Particle density (assumed) 2.65 Mg/m ³	
0.425	32		
0.3	28		
0.212	25		
0.15	22		
0.063	19		

Dry Mass of sample, g

4664

Sample Proportions	% dry mass
Cobbles	9.9
Gravel	43.1
Sand	27.8
Silt	15.3
Clay	3.9

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	550
Curvature Coefficient	1.9

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



LABORATORY REPORT



Contract Number: PSL23/9483

Report Date: 28 November 2023
Client's Reference: 23-0343
Client Name: Causeway Geotech
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route
Date Received: 9/11/2023
Date Commenced: 9/11/2023
Date Completed: 28/11/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Dublin Array Onshore Cable Route

Contract No:

PSL23/9483

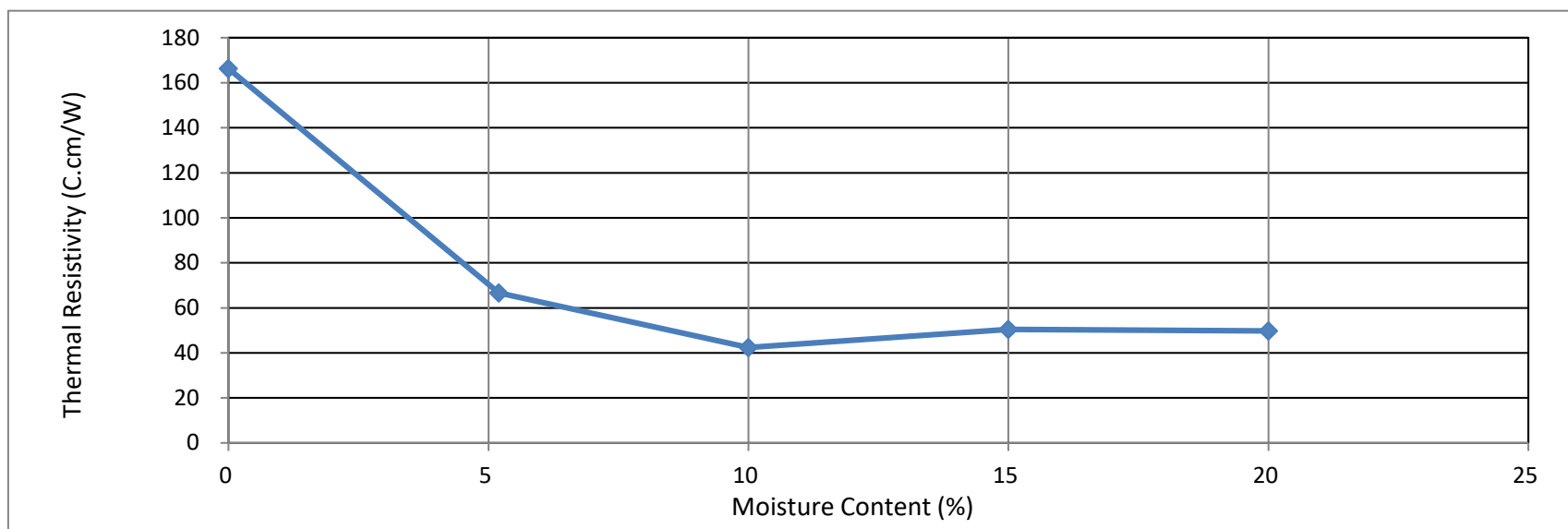
Client Ref:

23-0343

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH02	7	B	1.20	2.30	0	1.56	1.56	0.601	166.3	17.7	
WP03_BH02	7	B	1.20	2.30	5.2	1.79	1.70	1.499	66.7	19.5	
WP03_BH02	7	B	1.20	2.30	10	1.99	1.81	2.356	42.4	17.2	
WP03_BH02	7	B	1.20	2.30	15	2.05	1.78	1.984	50.4	16.6	
WP03_BH02	7	B	1.20	2.30	20	2.00	1.67	2.012	49.7	16.2	Natural



Contract No:

PSL23/

Client Ref:

PSLRF100

Issue No.1

Approved by: L Pavey

03/01/2023

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

[illegible]

Dublin Array Onshore Cable Route

Contract No:

PSL23/9483

Client Ref:

23-0343

PSLRF021

Issue No.1

Approved by: L Pavey

03/01/2023

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

[illegible]

Dublin Array Onshore Cable Route

Contract No:

PSL23/9483

Client Ref:

23-0343

PSLRF021

Issue No.1

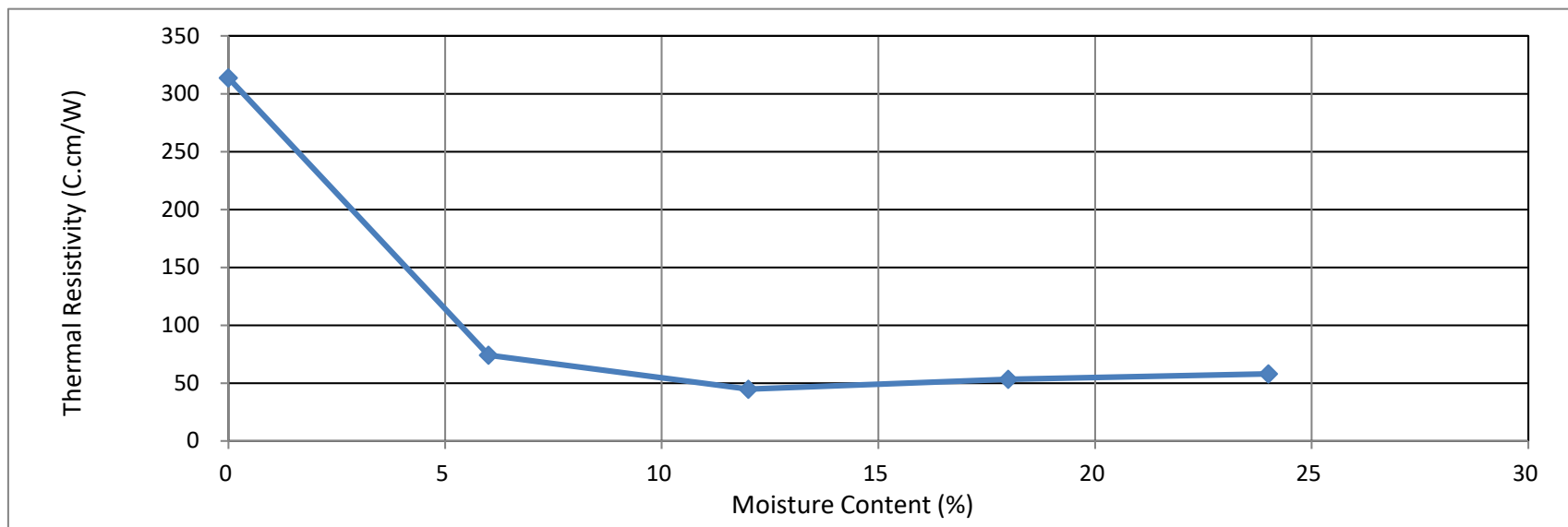
Approved by: L Pavey

03/01/2023

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH10	5	B	1.20	1.70	0	1.45	1.45	0.319	313.7	19.2	
WP03_BH10	5	B	1.20	1.70	6.0	1.73	1.63	1.348	74.2	21.5	
WP03_BH10	5	B	1.20	1.70	12	1.98	1.77	2.233	44.8	17.2	
WP03_BH10	5	B	1.20	1.70	18	1.97	1.67	1.881	53.2	16.5	
WP03_BH10	5	B	1.20	1.70	24	1.93	1.56	1.727	57.9	15.8	Natural



Dublin Array Onshore Cable Route

Contract No:

PSL23/9483

Client Ref:

23-0343

PSLRF100

Issue No.1

Approved by: L Pavey

03/01/2023

**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT**

22 January 2024

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

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 15/11/2023 and 05/12/2023.

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

Project Name: Dublin Array Onshore Cable Route

Report Reference: Schedule 4 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	15
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	5
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	9
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	7

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 Pro Soils Limited (<i>UKAS 4043</i>)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	4
SOIL – subcontracted to Pro Soils Limited (<i>UKAS 4043</i>)	Thermal Conductivity / Resistivity (3 Single Point tests at NMC)	ASTM D5334	5

Summary of Classification Test Results

Project No. 23-0343		Project Name Dublin Array Onshore Cable Route												
Hole No.	Sample				Specimen Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
WP03_BH01		3.80	5.30	C	Brown sandy slightly gravelly silty CLAY.			11						
WP03_BH07	5	1.20	1.65	D	Brown sandy gravelly silty CLAY.			16	44	34 -1pt	20	14		CL
WP03_BH07	6	1.20	2.00	B	Brown sandy gravelly silty CLAY.			12						
WP03_BH07	8	3.20	4.00	B	Brown slightly clayey slightly sandy subangular fine to coarse GRAVEL.			10						
WP03_BH07	12	4.00		D	Brown slightly clayey slightly sandy subangular fine to coarse GRAVEL			10	23	35 -1pt	24	11		CL/CI/ML/MI
WP03_BH08	1	0.20	1.20	B	Brown sandy slightly gravelly silty CLAY.			15						
WP03_BH08	9	1.20	1.65	D	Brown sandy slightly gravelly silty CLAY.			13	66	26 -1pt	15	11		CL
WP03_BH08	4	2.00	2.45	U	Brown sandy slightly gravelly silty CLAY.			12						
WP03_BH09	15	1.20	2.00	B	Brown sandy slightly gravelly silty CLAY.			9.7						
WP03_BH09	3	2.00	2.45	D	Brown sandy slightly gravelly silty CLAY.			21	65	37 -1pt	24	13		CI
WP03_BH09	10	4.00	4.45	D	Brown sandy slightly gravelly silty CLAY.			11	71	30 -1pt	18	12		CL
WP03_BH09	18	4.00	5.00	B	Brown sandy slightly gravelly silty CLAY.			15						


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

LAB 01R Version 6

Key			Date Printed	Approved By	 10122
Density test	Liquid Limit	Particle density	12/05/2023 00:00	Stephen Watson	
Linear measurement unless :	4pt cone unless :	sp - small pycnometer			
wd - water displacement	cas - Casagrande method	gj - gas jar			
wi - immersion in water	1pt - single point test				



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

Key			Date Printed	Approved By	 10122
Density test	Liquid Limit	Particle density	12/05/2023 00:00		
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				
				Stephen Watson	



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH01

Site Name

Dublin Array Onshore Cable Route

Sample No.

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

3.80

Base

5.30

Specimen Reference

4

Specimen
Depth

3.8

m

Sample Type

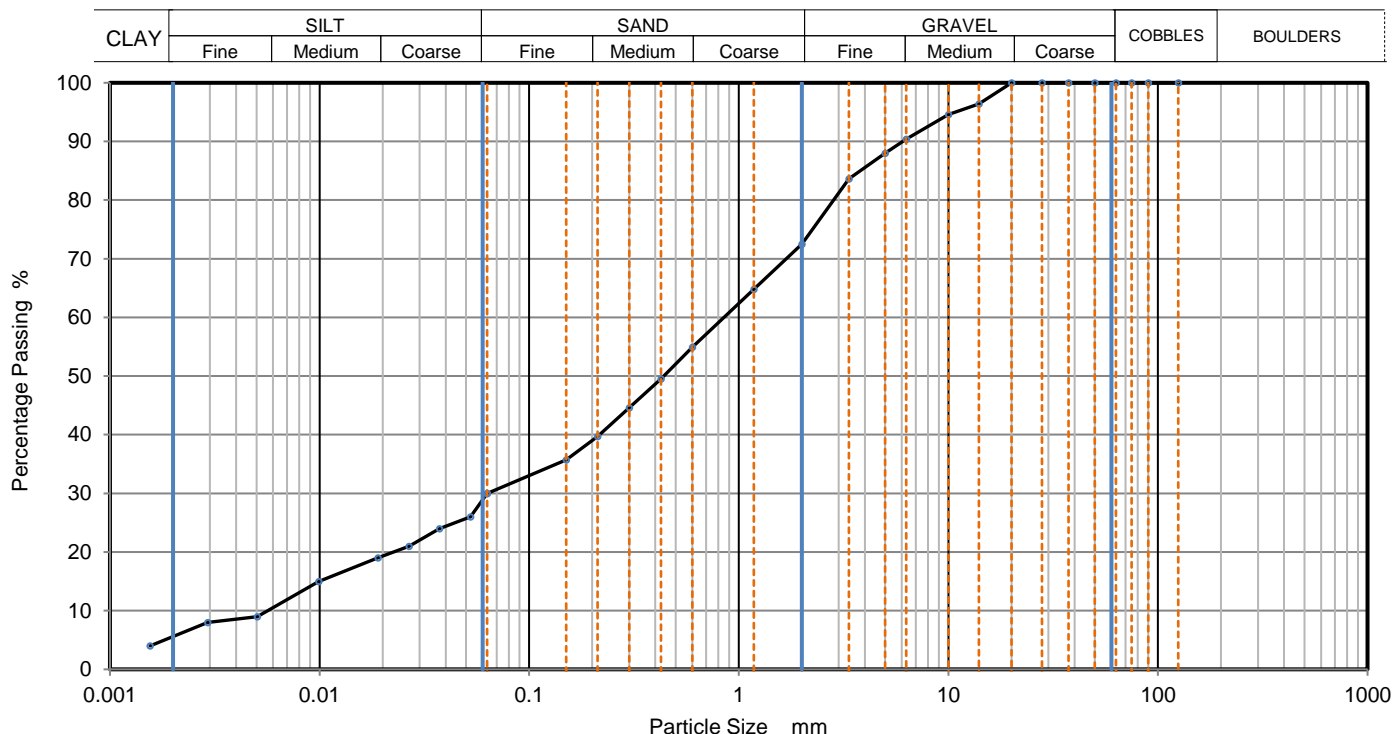
C

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311150



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	30
90	100	0.05247	26
75	100	0.03732	24
63	100	0.02669	21
50	100	0.01898	19
37.5	100	0.00991	15
28	100	0.00504	9
20	100	0.00292	8
14	96	0.00155	4
10	95		
6.3	90		
5	88		
3.35	84		
2	73		
1.18	65		
0.6	55	Particle density (assumed) 2.65 Mg/m3	
0.425	50		
0.3	45		
0.212	40		
0.15	36		
0.063	30		

Dry Mass of sample, g

538

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	27.5
Sand	42.6
Silt	24.7
Clay	5.2

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	160
Curvature Coefficient	

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH07

Site Name

Dublin Array Onshore Cable Route

Sample No.

6

Specimen Description

Brown sandy gravelly silty CLAY.

Sample
Depth (m)

Top

1.20

Base

2.00

Specimen Reference

4

Specimen
Depth

1.2

m

Sample Type

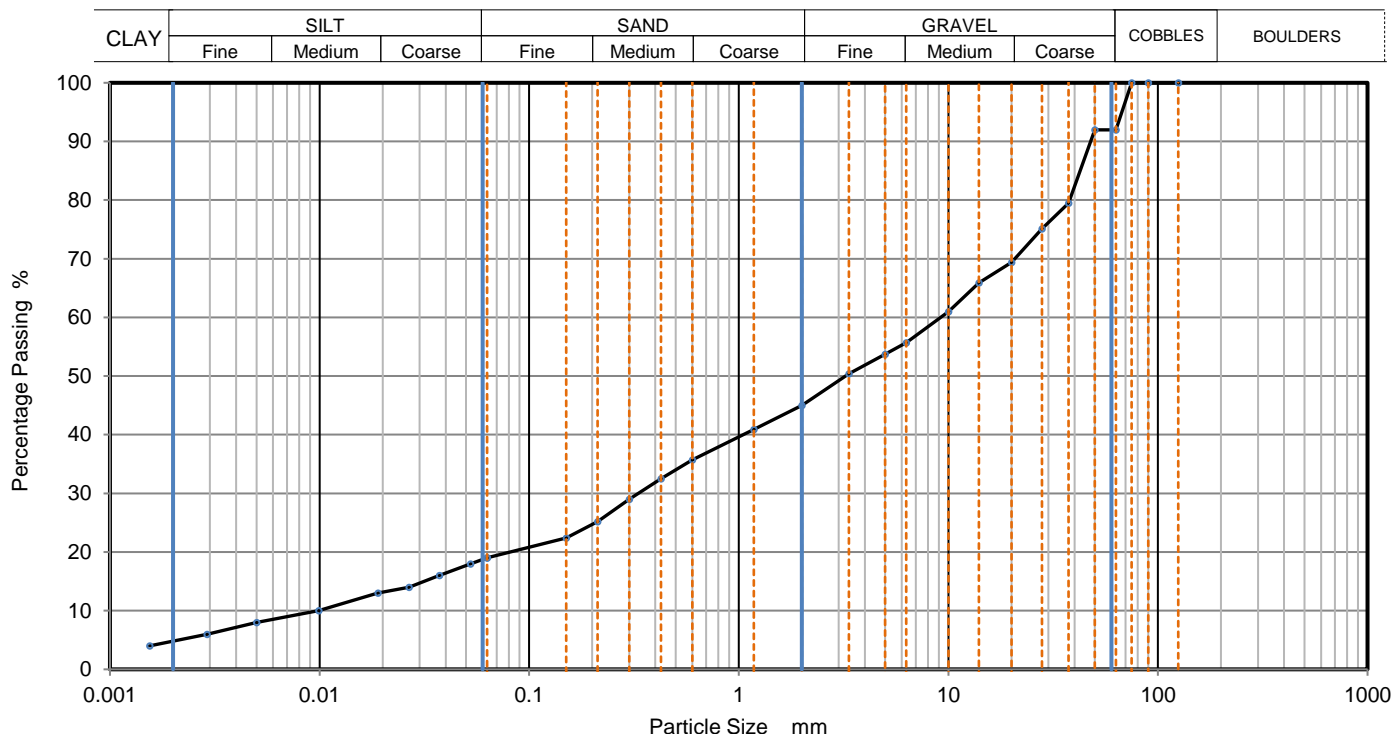
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311152



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	19
90	100	0.05247	18
75	100	0.03732	16
63	92	0.02669	14
50	92	0.01898	13
37.5	80	0.00991	10
28	75	0.00501	8
20	69	0.00291	6
14	66	0.00155	4
10	61		
6.3	56		
5	54		
3.35	50		
2	45		
1.18	41		
0.6	36	Particle density (assumed) 2.65 Mg/m ³	
0.425	33		
0.3	29		
0.212	25		
0.15	22		
0.063	19		

Dry Mass of sample, g

10259

Sample Proportions	% dry mass
Cobbles	8.0
Gravel	47.0
Sand	26.0
Silt	14.2
Clay	4.8

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	960
Curvature Coefficient	1.3

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved

Stephen Watson

LAB 05R - Version 6



10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH07

Site Name

Dublin Array Onshore Cable Route

Sample No.

8

Specimen Description

Brown slightly clayey slightly sandy subangular fine to coarse GRAVEL.

Sample
Depth (m)Top
Base

3.20

4.00

Specimen Reference

4

Specimen
Depth

3.2

m

Sample Type

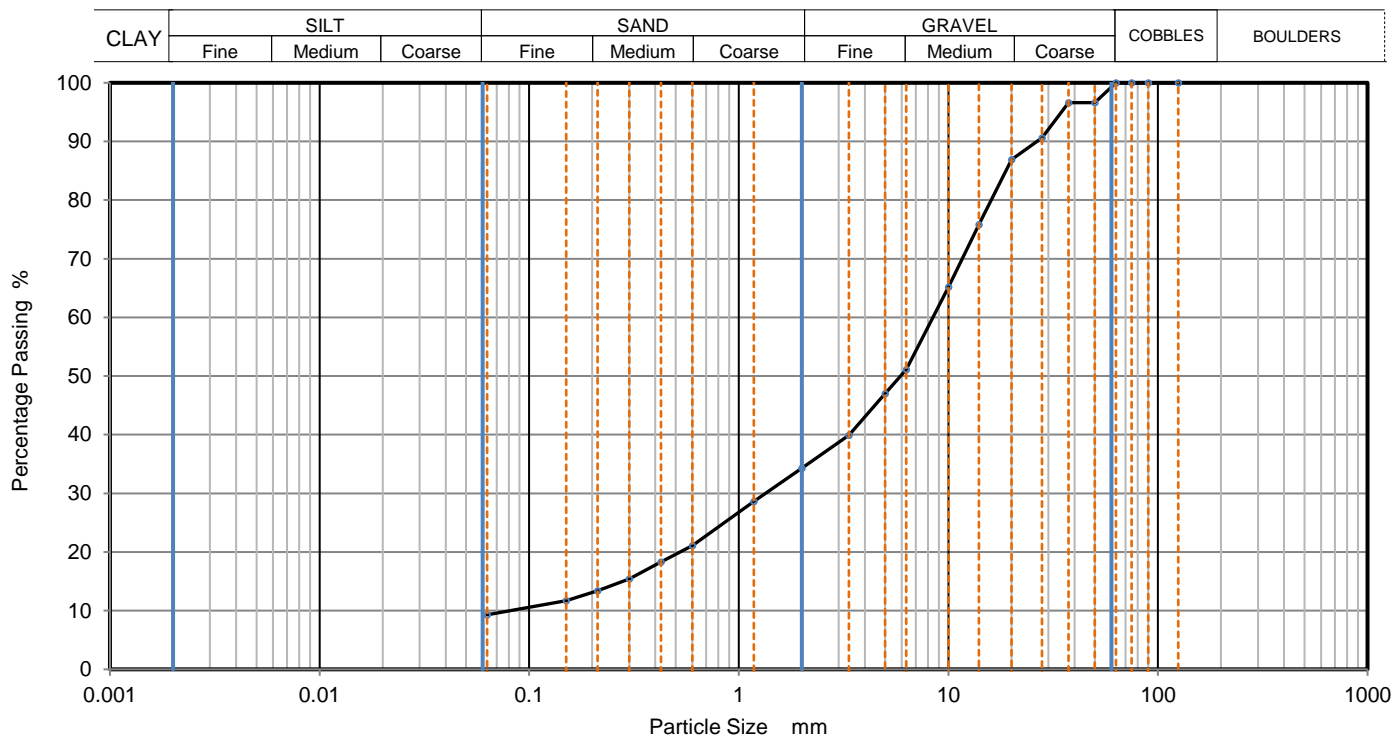
B

Test Method

BS1377:Part 2:1990, clause 9.2

KeyLAB ID

Caus202311154



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	97		
37.5	97		
28	91		
20	87		
14	76		
10	65		
6.3	51		
5	47		
3.35	40		
2	34		
1.18	29		
0.6	21		
0.425	18		
0.3	15		
0.212	13		
0.15	12		
0.063	9		

Dry Mass of sample, g

8916

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	65.7
Sand	25.0
Fines <0.063mm	9.0

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	100
Curvature Coefficient	2.6

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH08

Site Name

Dublin Array Onshore Cable Route

Sample No.

1

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

0.20

Base

1.20

Specimen Reference

4

Specimen
Depth

0.2

m

Sample Type

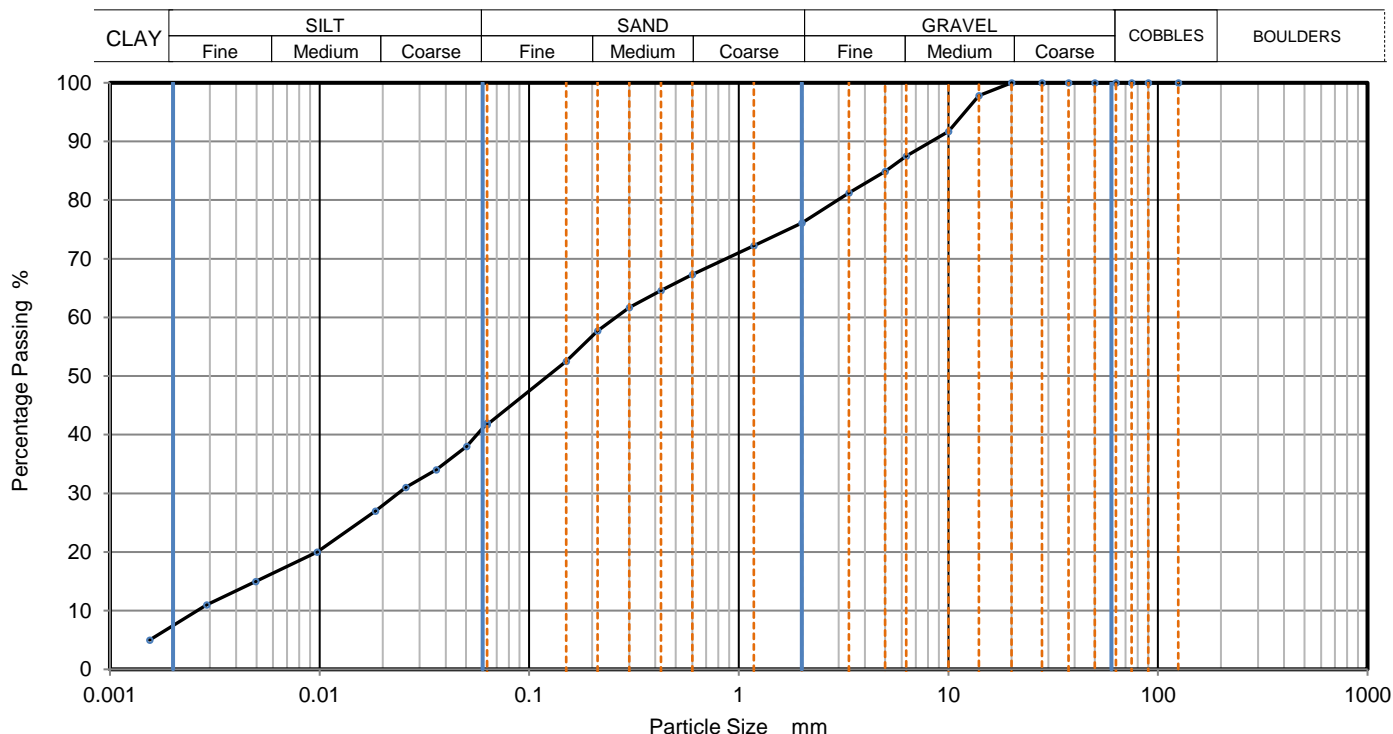
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311157



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	42
90	100	0.05027	38
75	100	0.03600	34
63	100	0.02577	31
50	100	0.01844	27
37.5	100	0.00975	20
28	100	0.00496	15
20	100	0.00289	11
14	98	0.00155	5
10	92		
6.3	88		
5	85		
3.35	81		
2	76		
1.18	72		
0.6	67	Particle density (assumed) 2.65 Mg/m ³	
0.425	65		
0.3	62		
0.212	58		
0.15	53		
0.063	42		

Dry Mass of sample, g

538

Sample Proportions

% dry mass

Cobbles	0.0
Gravel	23.9
Sand	34.4
Silt	34.0
Clay	7.7

Grading Analysis

D100	mm	
D60	mm	0.258
D30	mm	0.0239
D10	mm	0.00261
Uniformity Coefficient		99
Curvature Coefficient		0.84

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below

Approved

Stephen Watson

LAB 05R - Version 6



10122

PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH09

Site Name

Dublin Array Onshore Cable Route

Sample No.

15

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top
Base

1.20
2.00

Specimen Reference

8

Specimen
Depth

1.2

m

Sample Type

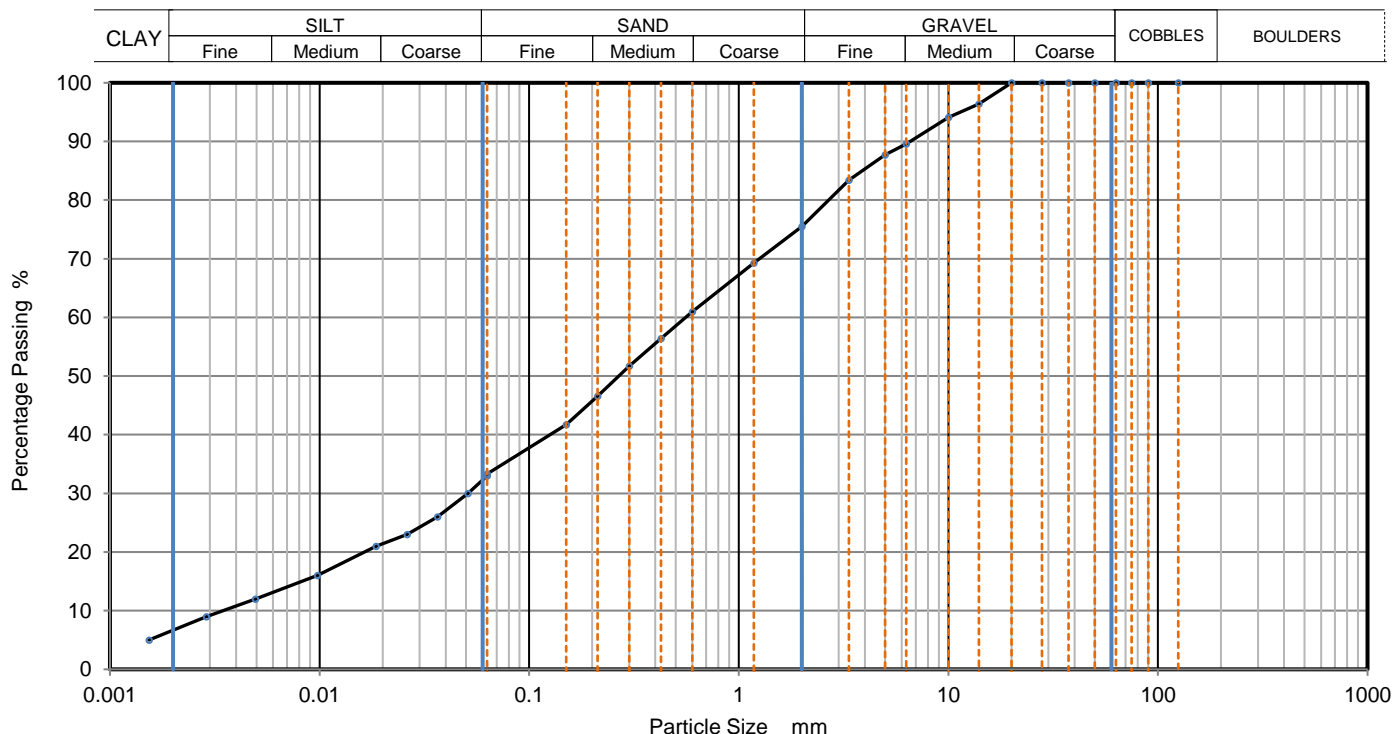
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311024



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	33
90	100	0.05105	30
75	100	0.03655	26
63	100	0.02615	23
50	100	0.01860	21
37.5	100	0.00977	16
28	100	0.00494	12
20	100	0.00288	9
14	96	0.00153	5
10	94		
6.3	90		
5	88		
3.35	83		
2	76		
1.18	69		
0.6	61	Particle density (assumed) 2.65 Mg/m ³	
0.425	56		
0.3	52		
0.212	47		
0.15	42		
0.063	33		

Dry Mass of sample, g

572

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	24.5
Sand	42.2
Silt	26.6
Clay	6.7

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	160
Curvature Coefficient	1.4

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved

Stephen Watson

LAB 05R - Version 6



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH09

Site Name

Dublin Array Onshore Cable Route

Sample No.

18

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

4.00

Base

5.00

Specimen Reference

8

Specimen
Depth

4

m

Sample Type

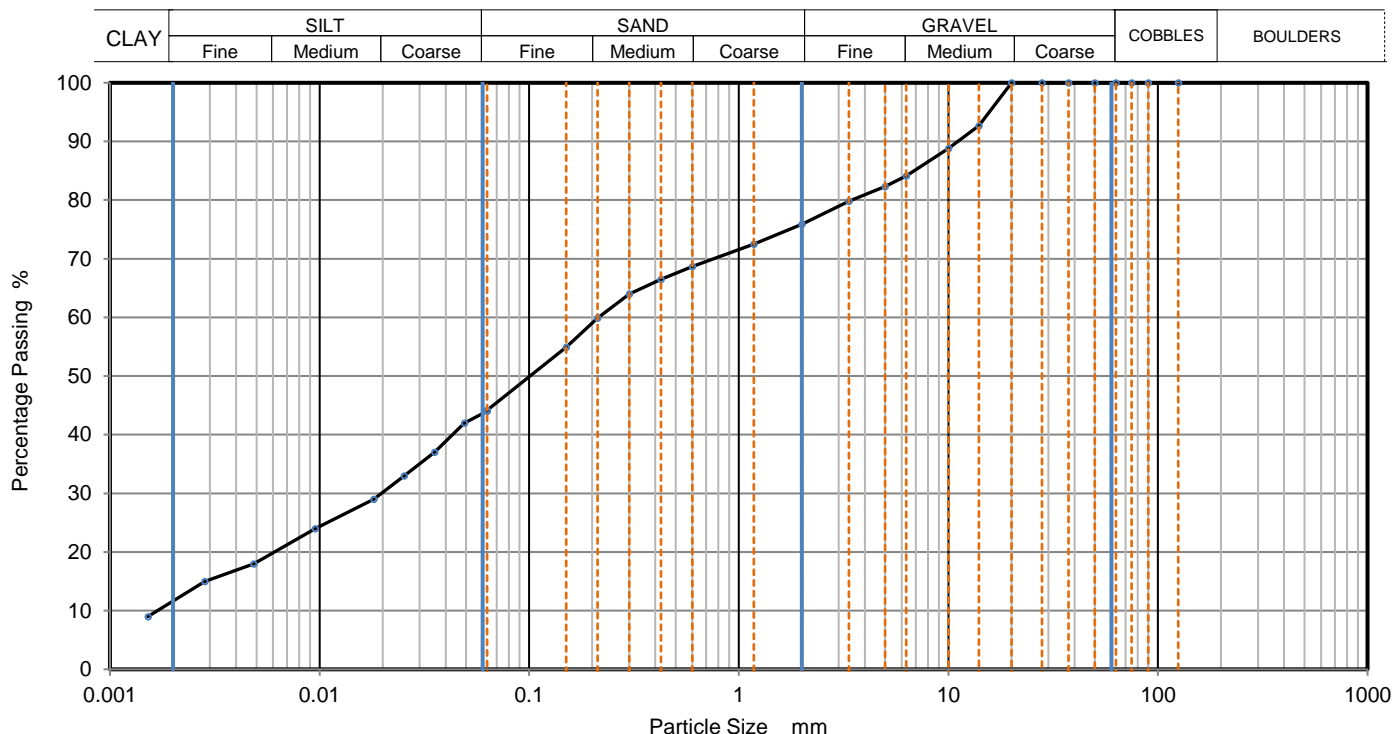
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311029



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	44
90	100	0.04912	42
75	100	0.03542	37
63	100	0.02537	33
50	100	0.01816	29
37.5	100	0.00955	24
28	100	0.00486	18
20	100	0.00284	15
14	93	0.00152	9
10	89		
6.3	84		
5	82		
3.35	80		
2	76		
1.18	73		
0.6	69	Particle density (assumed) 2.65 Mg/m3	
0.425	67		
0.3	64		
0.212	60		
0.15	55		
0.063	44		

Dry Mass of sample, g

545

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	24.1
Sand	31.7
Silt	32.6
Clay	11.6

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	130
Curvature Coefficient	1

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122

PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH09

Site Name

Dublin Array Onshore Cable Route

Sample No.

19

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

5.00

Base

6.30

Specimen Reference

4

Specimen
Depth

5

m

Sample Type

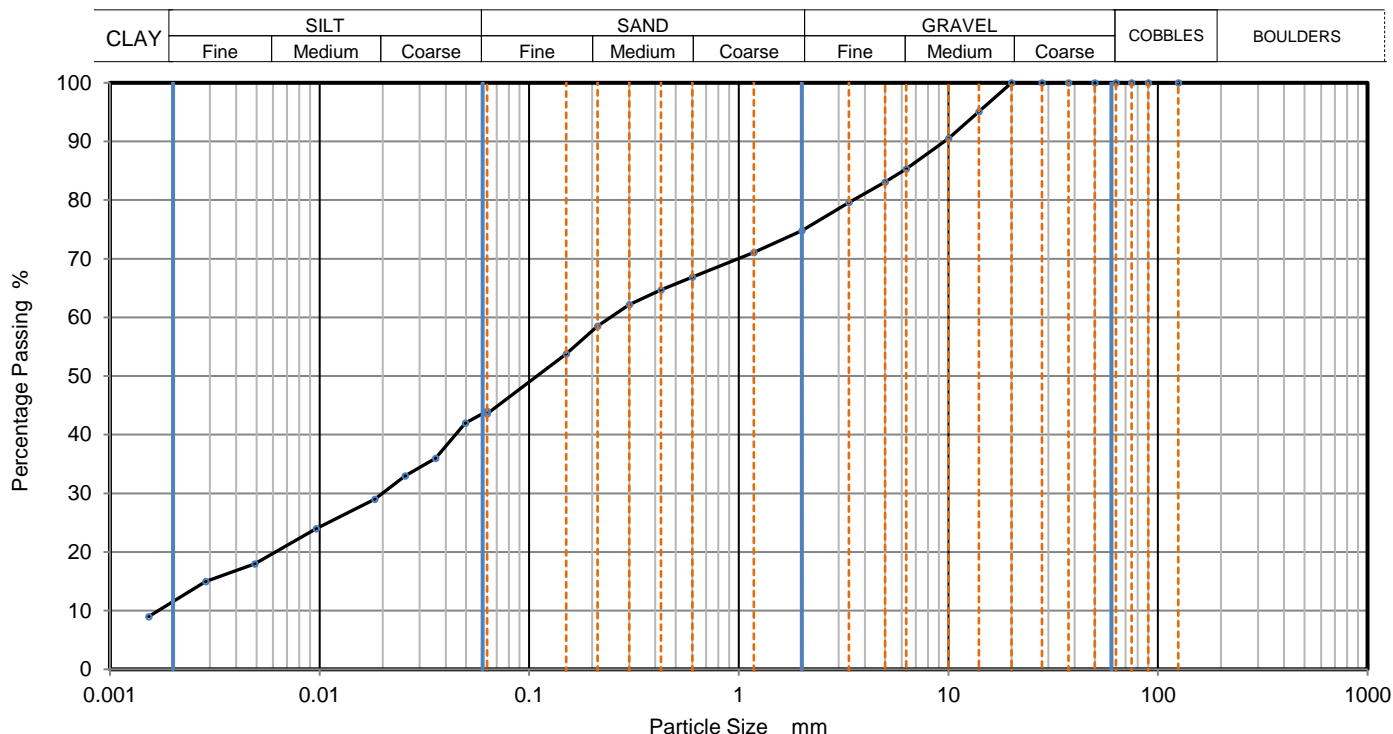
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus2023111512



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	44
90	100	0.04962	42
75	100	0.03577	36
63	100	0.02561	33
50	100	0.01833	29
37.5	100	0.00964	24
28	100	0.00490	18
20	100	0.00286	15
14	95	0.00153	9
10	91		
6.3	85		
5	83		
3.35	80		
2	75		
1.18	71		
0.6	67		
0.425	65	Particle density (assumed)	
0.3	62	2.65	Mg/m3
0.212	59		
0.15	54		
0.063	44		

Dry Mass of sample, g

531

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	25.2
Sand	31.1
Silt	32.3
Clay	11.4

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	140
Curvature Coefficient	0.96

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved

Stephen Watson

LAB 05R - Version 6



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH11

Site Name

Dublin Array Onshore Cable Route

Sample No.

10

Specimen Description

Brown slightly sandy slightly clayey subangular fine to coarse GRAVEL.

Sample
Depth (m)

Top

3.80

Base

5.30

Specimen Reference

4

Specimen
Depth

3.8

m

Sample Type

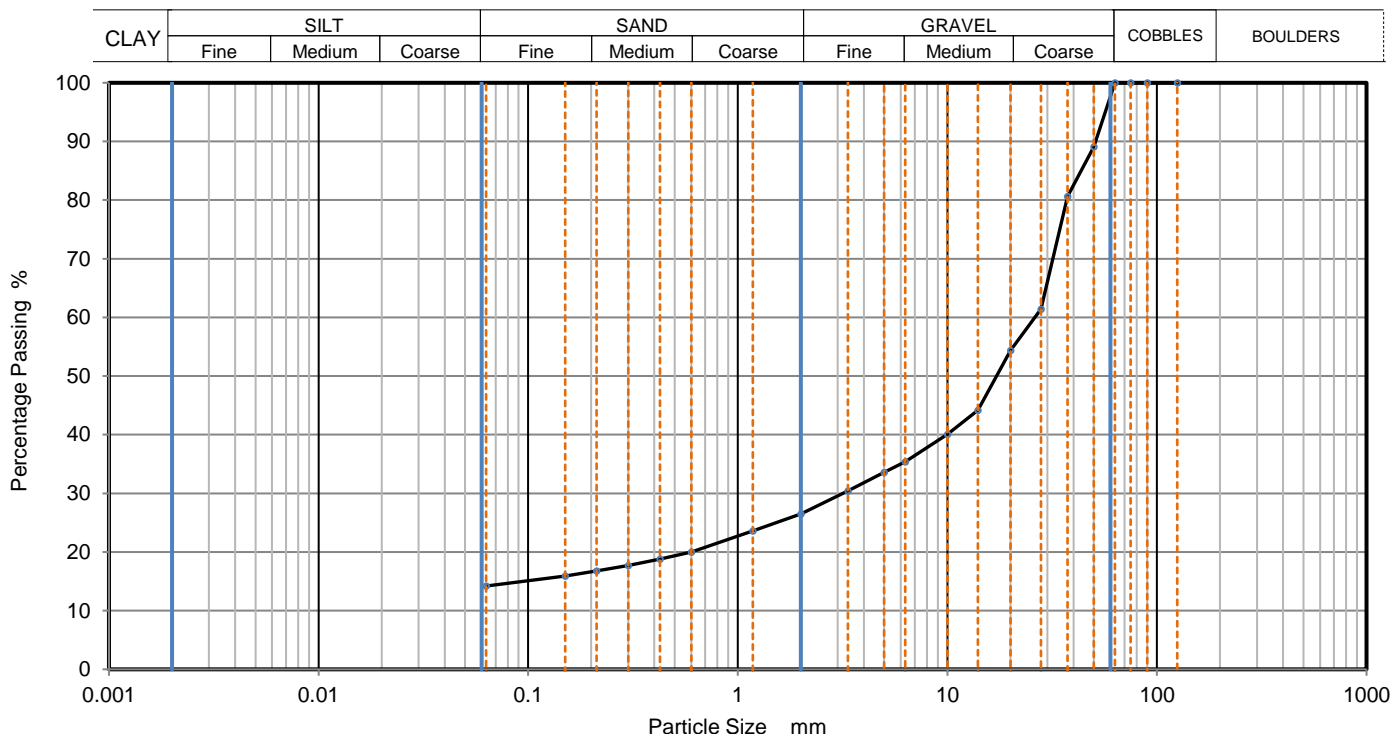
C

Test Method

BS1377:Part 2:1990, clause 9.2

KeyLAB ID

Caus2023111514



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	89		
37.5	81		
28	61		
20	54		
14	44		
10	40		
6.3	35		
5	34		
3.35	30		
2	27		
1.18	24		
0.6	20		
0.425	19		
0.3	18		
0.212	17		
0.15	16		
0.063	14		

Dry Mass of sample, g

5458

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	73.5
Sand	12.3
Fines <0.063mm	14.0

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

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH14

Site Name

Dublin Array Onshore Cable Route

Sample No.

6

Specimen Description

Brown sandy gravelly silty CLAY.

Sample
Depth (m)

Top

0.20

Base

1.20

Specimen Reference

4

Specimen
Depth

0.2

m

Sample Type

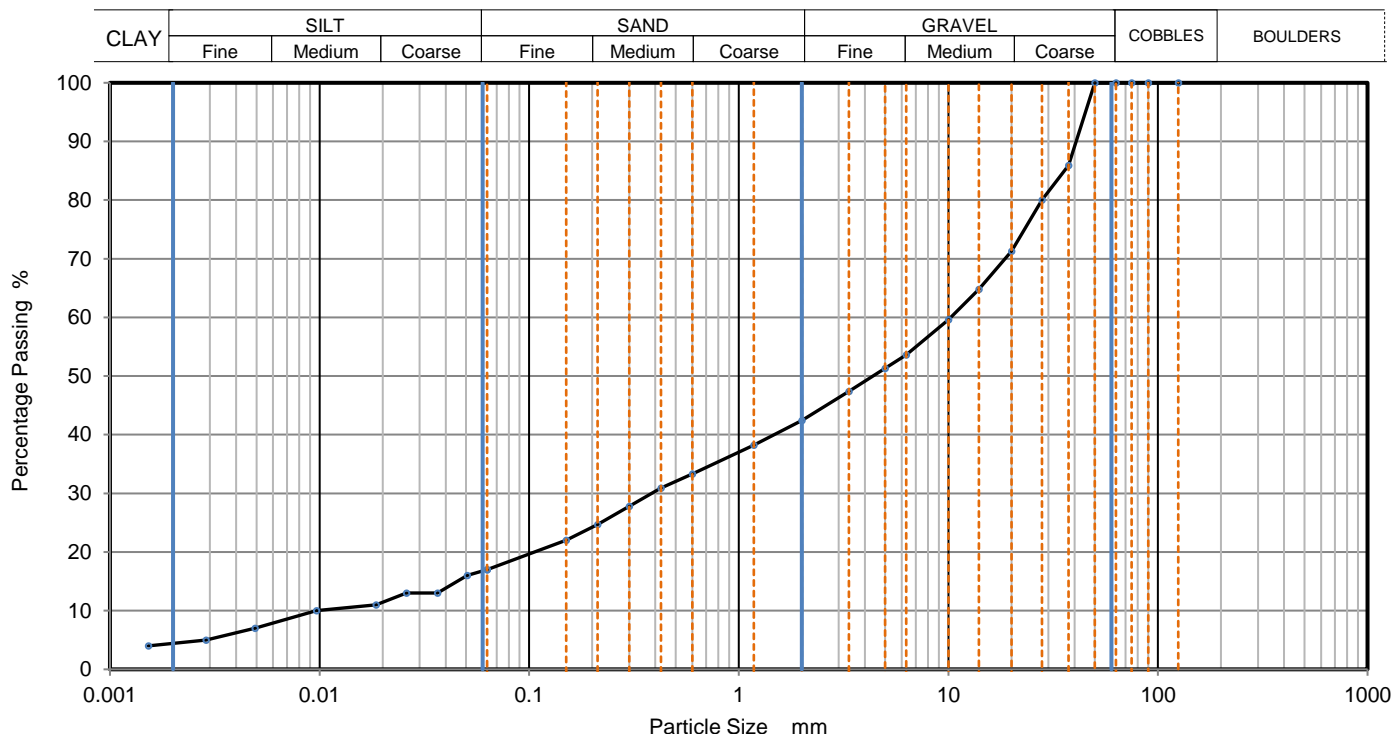
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus2023111515



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	17
90	100	0.05074	16
75	100	0.03655	13
63	100	0.02600	13
50	100	0.01860	11
37.5	86	0.00966	10
28	80	0.00491	7
20	71	0.00287	5
14	65	0.00153	4
10	60		
6.3	54		
5	51		
3.35	47		
2	42		
1.18	38		
0.6	33	Particle density (assumed) 2.65 Mg/m ³	
0.425	31		
0.3	28		
0.212	25		
0.15	22		
0.063	17		

Dry Mass of sample, g

4153

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	57.6
Sand	25.4
Silt	12.7
Clay	4.3

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	950
Curvature Coefficient	1.3

Remarks

Preparation and testing in accordance with BS1377-2:1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



LABORATORY REPORT



Contract Number: PSL23/10111

Report Date: 19 January 2024
Client's Reference: 23-0343
Client Name: Causeway Geotech
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route
Date Received: 30/11/2023
Date Commenced: 30/11/2023
Date Completed: 19/1/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Dublin Array Onshore Cable Route

Contract No:

PSL23/10111

Client Ref:

23-0343

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH07	15	B	4.00	5.00	6.7	1.97	1.85	2.652	37.7	13.9	
WP03_BH07	15	B	4.00	5.00	6.6	1.96	1.84	2.639	37.9	14.0	
WP03_BH07	15	B	4.00	5.00	6.4	1.98	1.86	2.674	37.4	14.0	
WP03_BH09	16	B	2.00	3.00	15	2.13	1.85	2.107	47.5	12.6	
WP03_BH09	16	B	2.00	3.00	15	2.13	1.85	2.092	47.8	12.7	
WP03_BH09	16	B	2.00	3.00	15	2.14	1.87	2.123	47.1	12.6	
WP03_BH09	9	U	3.00	3.45	16	2.12	1.83	2.517	39.7	12.2	
WP03_BH09	9	U	3.00	3.45	16	2.13	1.84	2.500	40.0	12.3	
WP03_BH09	9	U	3.00	3.45	16	2.11	1.82	2.525	39.6	12.1	
WP03_BH09	10	U	5.00	5.45	12	2.20	1.96	2.623	38.1	13.6	
WP03_BH09	10	U	5.00	5.45	12	2.21	1.98	2.604	38.4	14.0	
WP03_BH09	10	U	5.00	5.45	12	2.21	1.97	2.632	38.0	13.8	
WP03_BH14	7	B	1.20	2.00	10	2.01	1.82	2.123	47.1	12.2	
WP03_BH14	7	B	1.20	2.00	10	2.02	1.84	2.110	47.4	12.6	
WP03_BH14	7	B	1.20	2.00	11	2.01	1.82	2.119	47.2	12.4	



Dublin Array Onshore Cable Route

Contract No:

PSL23/10111

Client Ref:

23-0343

PSLRF021

Issue No.1

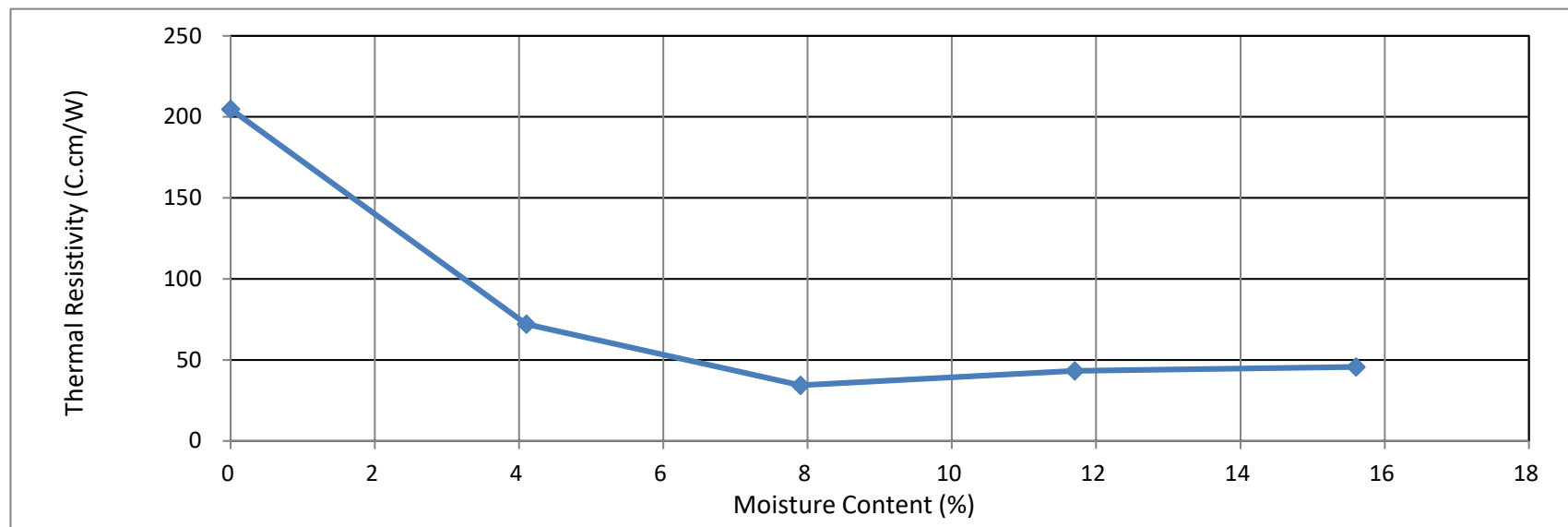
Approved by: L Pavey

03/01/2023

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH07	9	B	2.00	3.00	0	1.68	1.68	0.488	204.8	19.3	
WP03_BH07	9	B	2.00	3.00	4.1	1.94	1.86	1.386	72.2	22.6	
WP03_BH07	9	B	2.00	3.00	7.9	2.13	1.97	2.909	34.4	15.3	
WP03_BH07	9	B	2.00	3.00	12	2.16	1.93	2.312	43.3	15.4	
WP03_BH07	9	B	2.00	3.00	16	2.11	1.83	2.186	45.7	13.6	Natural



Dublin Array Onshore Cable Route

Contract No:

PSL23/10111

Client Ref:

23-0343

PSLRF100

Issue No.1

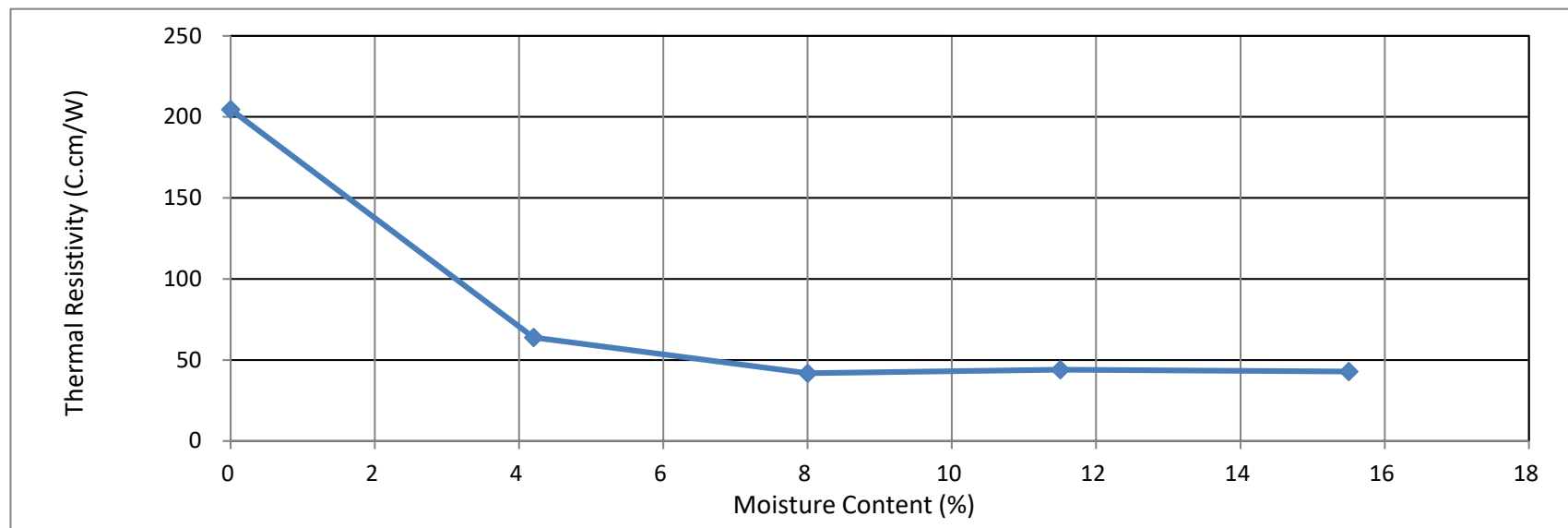
Approved by: L Pavey

03/01/2023

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH08	2	B	1.20	2.00	0	1.66	1.66	0.489	204.6	19.2	
WP03_BH08	2	B	1.20	2.00	4.2	1.91	1.83	1.567	63.8	22.9	
WP03_BH08	2	B	1.20	2.00	8.0	2.10	1.94	2.389	41.9	19.8	
WP03_BH08	2	B	1.20	2.00	12	2.18	1.96	2.272	44.0	18.8	
WP03_BH08	2	B	1.20	2.00	16	2.18	1.89	2.336	42.8	13.6	Natural



Dublin Array Onshore Cable Route

Contract No:

PSL23/10111

Client Ref:

23-0343

PSLRF100

Issue No.1

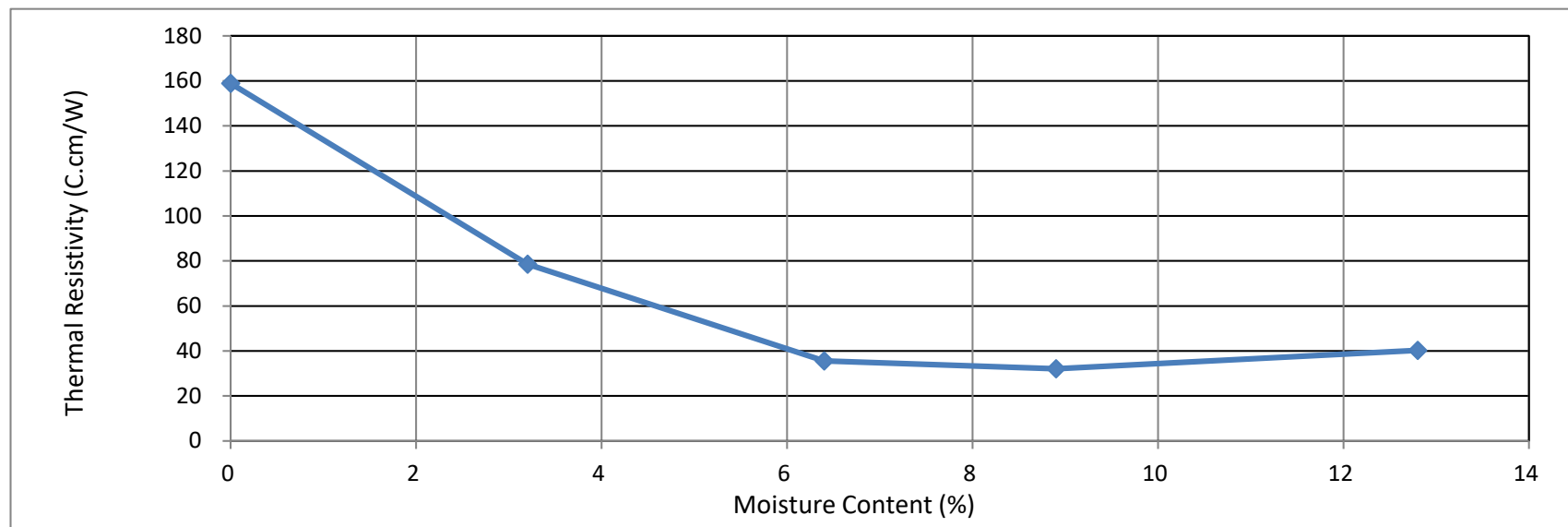
Approved by: L Pavey

03/01/2023

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH08	4	U	2.00	2.45	0	1.71	1.71	0.629	158.9	18.3	
WP03_BH08	4	U	2.00	2.45	3.2	1.94	1.88	1.274	78.5	20.9	
WP03_BH08	4	U	2.00	2.45	6.4	2.04	1.92	2.816	35.5	19.3	
WP03_BH08	4	U	2.00	2.45	8.9	2.20	2.02	3.117	32.1	17.4	
WP03_BH08	4	U	2.00	2.45	13	2.18	1.93	2.486	40.2	15.2	Natural



Dublin Array Onshore Cable Route

Contract No:

PSL23/10111

Client Ref:

23-0343

PSLRF100

Issue No.1

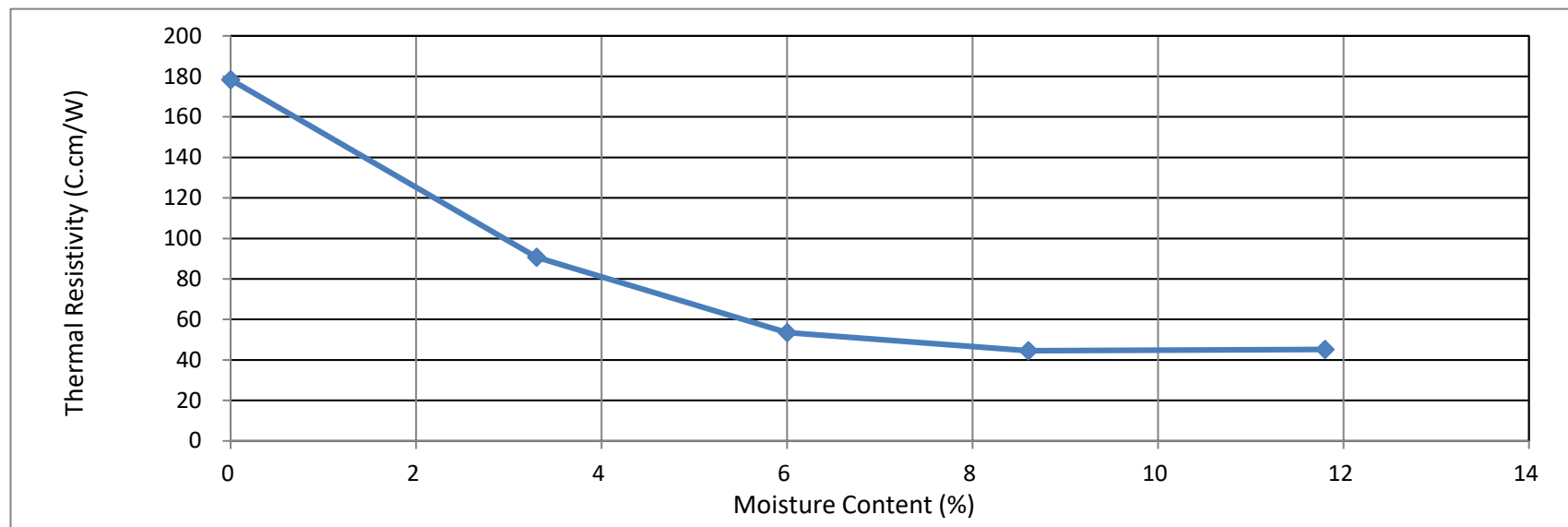
Approved by: L Pavey

03/01/2023

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH11		C	1.20	2.00	0	1.76	1.76	0.561	178.4	17.1	
WP03_BH11		C	1.20	2.00	3.3	1.93	1.87	1.103	90.7	19.9	
WP03_BH11		C	1.20	2.00	6.0	2.02	1.91	1.868	53.5	17.9	
WP03_BH11		C	1.20	2.00	8.6	2.17	2.00	2.244	44.6	17.0	
WP03_BH11		C	1.20	2.00	11.8	2.24	2.00	2.214	45.2	12.7	Natural



Dublin Array Onshore Cable Route

Contract No:

PSL23/10111

Client Ref:

23-0343

**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT**

22 January 2024

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

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 29/11/2023 and 06/01/2024.

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

Project Name: Dublin Array Onshore Cable Route

Report Reference: Schedule 5 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	3
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	1
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	3
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	3

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 Pro Soils Limited (<i>UKAS 4043</i>)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	1



Project Name

Dublin Array Onshore Cable Route

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

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH10A

Site Name

Dublin Array Onshore Cable Route

Sample No.

3

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

5.50

Base

5.95

Specimen Reference

3

Specimen
Depth

5.5

m

Sample Type

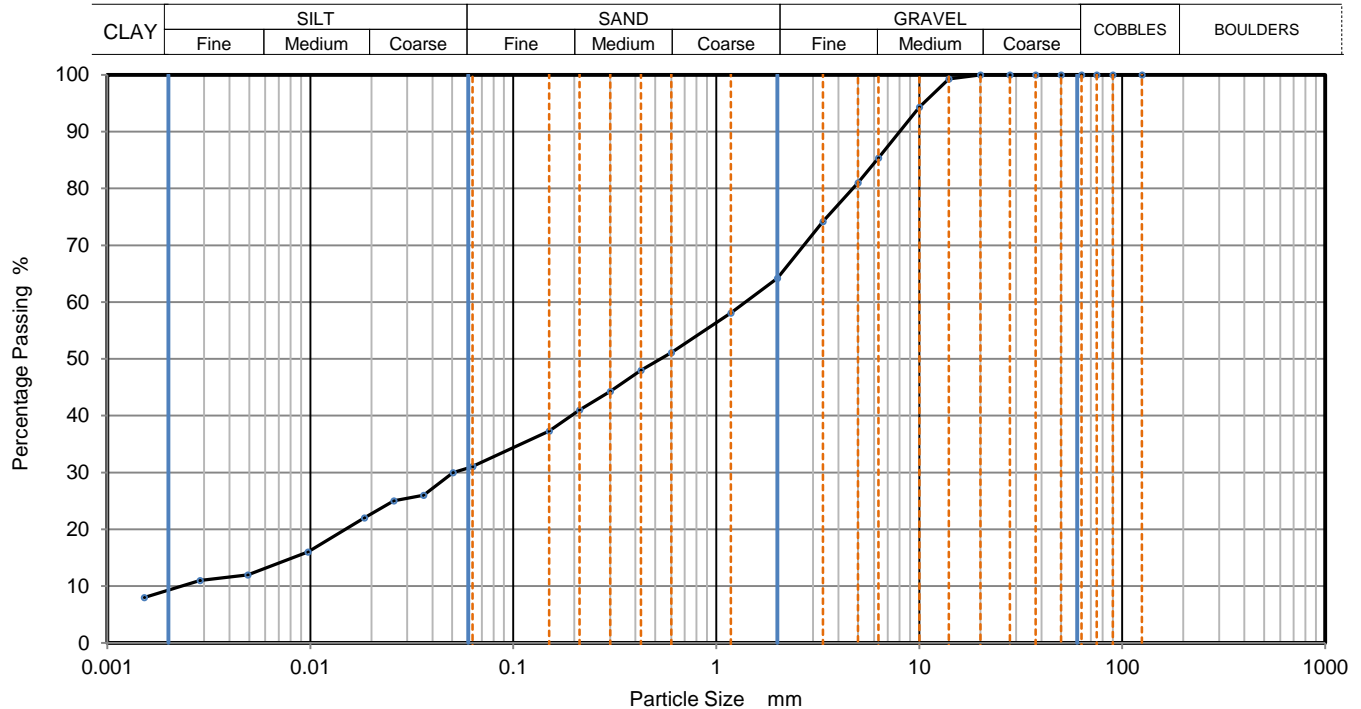
D

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311301



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	31
90	100	0.05058	30
75	100	0.03621	26
63	100	0.02577	25
50	100	0.01844	22
37.5	100	0.00975	16
28	100	0.00493	12
20	100	0.00286	11
14	99	0.00152	8
10	94		
6.3	85		
5	81		
3.35	74		
2	64		
1.18	58		
0.6	51	Particle density (assumed) 2.65 Mg/m ³	
0.425	48		
0.3	44		
0.212	41		
0.15	37		
0.063	31		

Dry Mass of sample, g

435

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	35.8
Sand	33.1
Silt	22.0
Clay	9.1

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	580
Curvature Coefficient	0.87

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Combined with D2 4.0m.



Approved

Stephen Watson

LAB 05R - Version 6

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH10A

Site Name

Dublin Array Onshore Cable Route

Sample No.

4

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

8.50

Base

9.80

Specimen Reference

6

Specimen
Depth

8.5

m

Sample Type

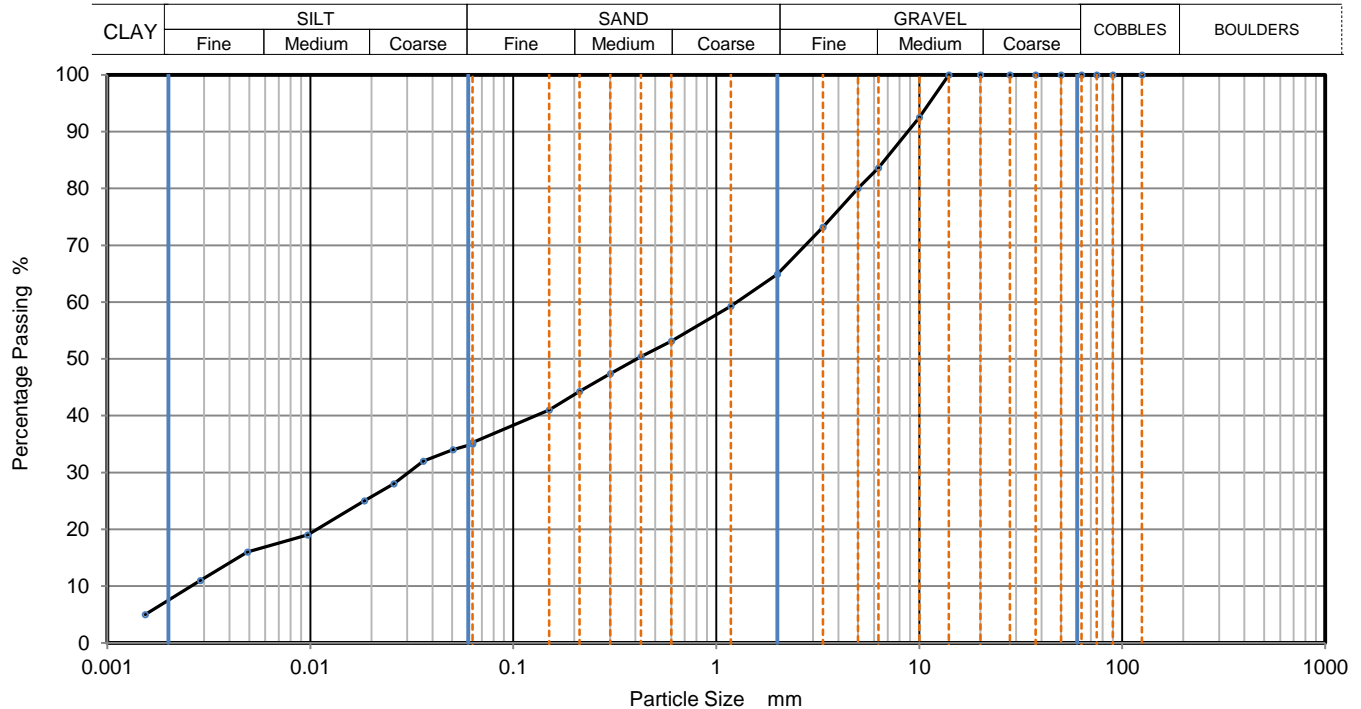
C

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311303



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	35
90	100	0.05058	34
75	100	0.03599	32
63	100	0.02577	28
50	100	0.01844	25
37.5	100	0.00969	19
28	100	0.00490	16
20	100	0.00288	11
14	100	0.00154	5
10	93		
6.3	84		
5	80		
3.35	73		
2	65		
1.18	59		
0.6	53	Particle density (assumed) 2.65 Mg/m ³	
0.425	50		
0.3	47		
0.212	44		
0.15	41		
0.063	35		

Dry Mass of sample, g

447

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	35.1
Sand	29.6
Silt	27.8
Clay	7.5

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

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH10A

Site Name

Dublin Array Onshore Cable Route

Sample No.

4

Specimen Description

Brown sandy gravelly silty CLAY.

Sample
Depth (m)

Top

9.80

Base

11.30

Specimen Reference

3

Specimen
Depth

9.8

m

Sample Type

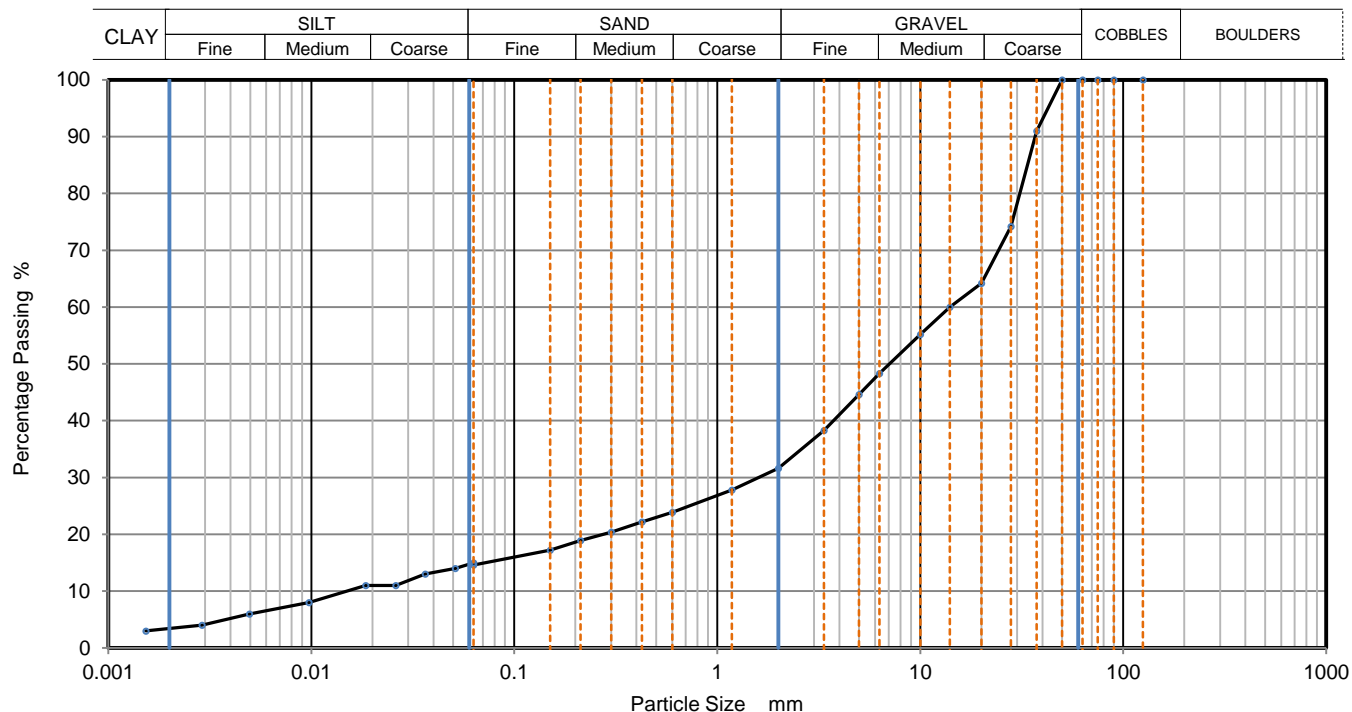
C

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus202311304



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	15
90	100	0.05122	14
75	100	0.03644	13
63	100	0.02608	11
50	100	0.01855	11
37.5	91	0.00975	8
28	74	0.00495	6
20	64	0.00289	4
14	60	0.00153	3
10	55		
6.3	48		
5	45		
3.35	38		
2	32		
1.18	28		
0.6	24	Particle density (assumed) 2.65 Mg/m ³	
0.425	22		
0.3	20		
0.212	19		
0.15	17		
0.063	15		

Dry Mass of sample, g

3285

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	68.4
Sand	17.0
Silt	11.0
Clay	3.6

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	870
Curvature Coefficient	11

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122

LABORATORY RESTRICTION REPORT

Project Reference	23-0343	To	Sean Ross
Project Name	Dublin Array Onshore Cable Route	Position	Project Manager
TR reference	23-0343 / G05	From	Joseph Nicholl
		Position	Laboratory Quality Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
WP03_B H10A	2 & 3	4.00 & 5.50	2 x D	TR - 5 point testing	Insufficient material for test	PSD carried out as per instructions on schedule
WP03_B H10A	4	7.00	D	Atterberg limits	Insufficient material for test, material was too granular	

For electronic reporting a form of electronic signature or printed name is acceptable

Laboratory Signature Joseph Nicholl	Project Manager Signature Sean Ross
Date 08 December 2023	Date



CAUSEWAY
GEOTECH

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Causeway Geotech Ltd
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Unit 1 Fingal House
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ROI: +353 (0)1 526 7465
Registered in Ireland.
Company Number: 633786

www.causewaygeotech.com

**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT**

6 January 2024

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

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 27/11/2023 and 06/01/2023.

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



Project Name: Dublin Array Onshore Cable Route

Report Reference: Schedule 5 – INTERIM

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	2
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	1
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	1
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	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 Pro Soils Limited (<i>UKAS 4043</i>)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	1
SOIL – subcontracted to Pro Soils Limited (<i>UKAS 4043</i>)	Thermal Conductivity / Resistivity (3 Single Point tests at NMC)	ASTM D5334	4



Project No.

23-0343

Project Name

Dublin Array Onshore Cable Route

[illegible]

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

LAB 01R Version 6

Key

Density test

Liquid Limit

Particle density

Linear measurement unless :

4pt cone unless :

sp - small pycnometer

wd - water displacement

cas - Casagrande method

gj - gas jar

wi - immersion in water

1pt - single point test

Date Printed

Approved By

01/06/2024 00:00

Stephen Watson



10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH08

Site Name

Dublin Array Onshore Cable Route

Sample No.

14

Specimen Description

Brown slightly gravelly clayey fine to coarse SAND.

Sample
Depth (m)

Top

7.00

Base

8.00

Specimen Reference

4

Specimen
Depth

7

m

Sample Type

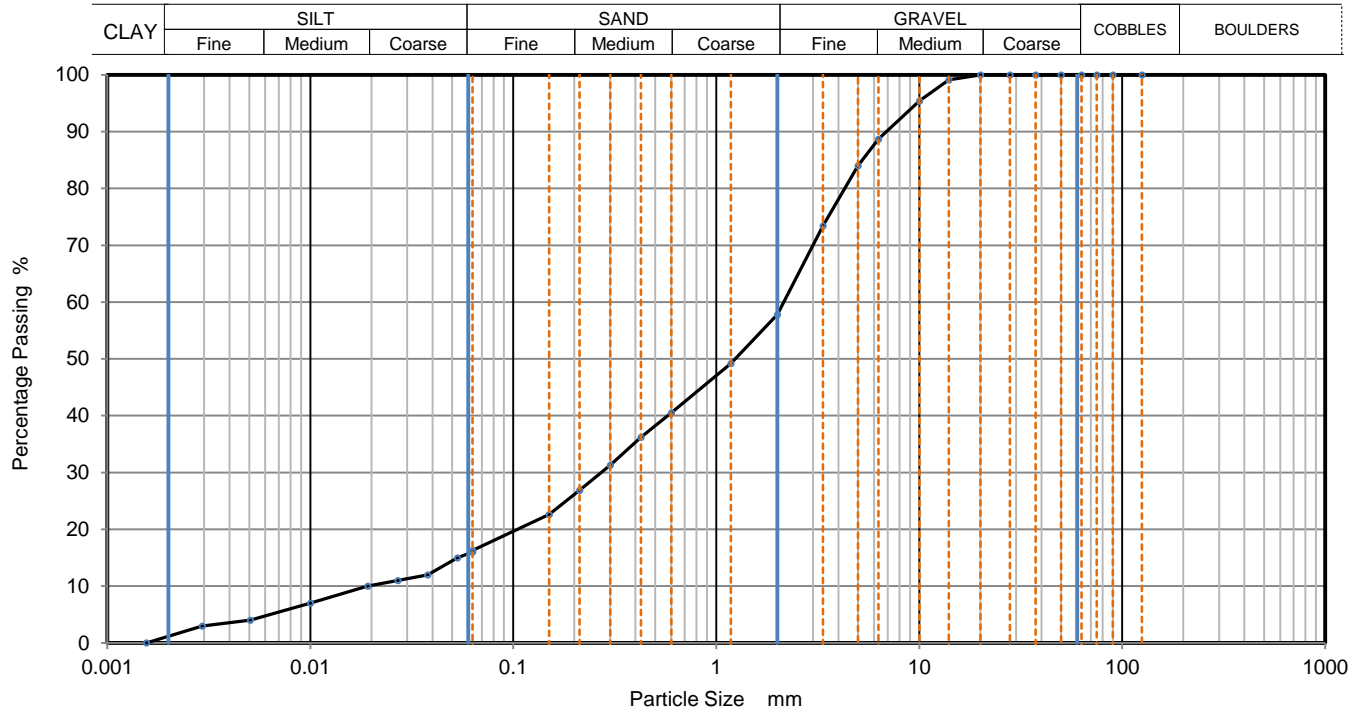
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus2023113011



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	16
90	100	0.05301	15
75	100	0.03791	12
63	100	0.02696	11
50	100	0.01917	10
37.5	100	0.01001	7
28	100	0.00506	4
20	100	0.00293	3
14	99	0.00156	0
10	95		
6.3	89		
5	84		
3.35	73		
2	58		
1.18	49		
0.6	41	Particle density (assumed) 2.65 Mg/m ³	
0.425	36		
0.3	31		
0.212	27		
0.15	23		
0.063	16		

Dry Mass of sample, g

487

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	42.2
Sand	41.5
Silt	15.2
Clay	1.1

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	99
Curvature Coefficient	1.6

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



LABORATORY REPORT



Contract Number: PSL23/10441

Report Date: 22 January 2024
Client's Reference: 23-0343
Client Name: Causeway Geotech
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route
Date Received: 13/12/2023
Date Commenced: 13/12/2023
Date Completed: 22/1/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

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Tel: 01302 768098
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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Dublin Array Onshore Cable Route

Contract No:

PSL23/10441

Client Ref:

23-0343

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH05	2	B	2.50	4.00	15	2.12	1.85	2.003	49.9	14.5	
WP03_BH05	2	B	2.50	4.00	15	2.12	1.84	2.075	48.2	14.9	
WP03_BH05	2	B	2.50	4.00	15	2.13	1.86	2.028	49.3	14.6	
WP03_BH05	5	B	7.00	8.50	9.4	2.01	1.84	2.500	40.0	14.5	
WP03_BH05	5	B	7.00	8.50	9.6	2.01	1.84	2.488	40.2	15.0	
WP03_BH05	5	B	7.00	8.50	9.7	2.02	1.84	2.519	39.7	14.8	
WP03_BH07	21	B	6.30	7.00	6.4	2.20	2.07	2.836	35.3	15.0	
WP03_BH07	21	B	6.30	7.00	6.4	2.20	2.07	2.817	35.5	15.8	
WP03_BH07	21	B	6.30	7.00	6.6	2.21	2.07	2.849	35.1	15.6	
WP03_BH08	11	B	4.00	5.50	7.1	2.27	2.12	3.008	33.2	15.9	
WP03_BH08	11	B	4.00	5.50	6.9	2.26	2.12	2.994	33.4	16.0	
WP03_BH08	11	B	4.00	5.50	7.2	2.27	2.12	3.030	33.0	15.9	



Dublin Array Onshore Route

Contract No:

PSL23/10441

Client Ref:

23-0343

PSLRF021

Issue No.1

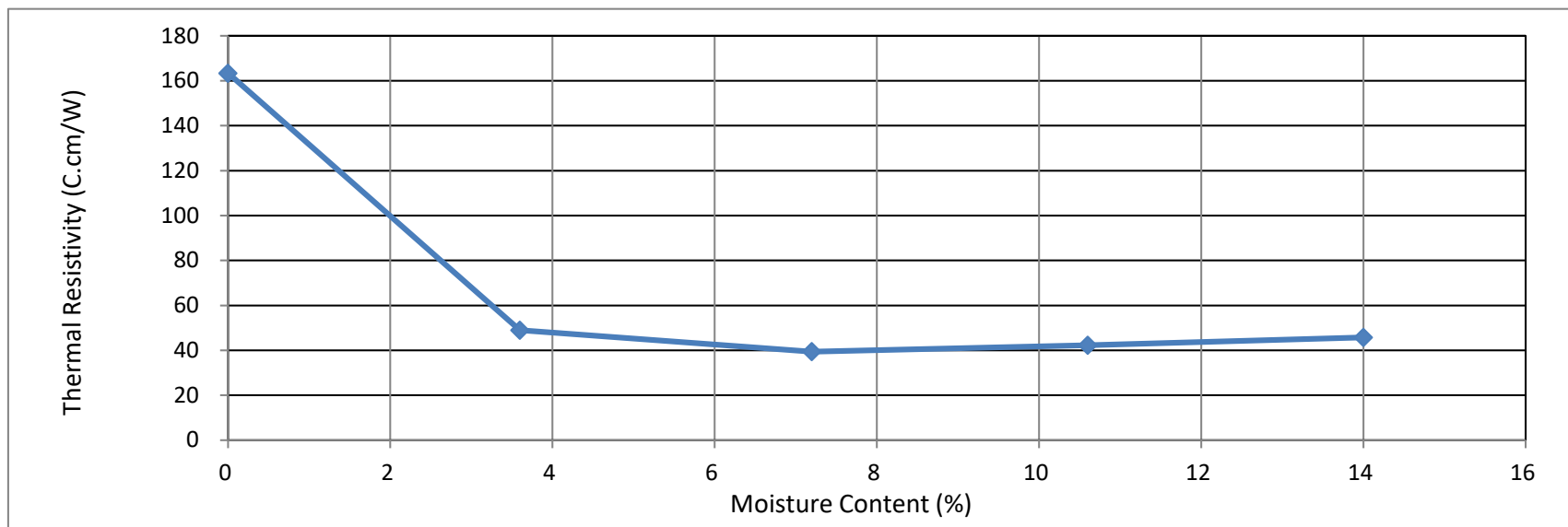
Approved by: L Pavey

03/01/2023

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH06	3	B	2.50	4.00	0	1.76	1.76	0.612	163.4	18.4	
WP03_BH06	3	B	2.50	4.00	3.6	1.94	1.87	2.045	48.9	20.2	
WP03_BH06	3	B	2.50	4.00	7.2	2.10	1.96	2.537	39.4	18.3	
WP03_BH06	3	B	2.50	4.00	11	2.19	1.98	2.367	42.2	17.5	
WP03_BH06	3	B	2.50	4.00	14	2.15	1.89	2.185	45.8	15.4	Natural



Dublin Array Onshore Cable Route

Contract No:

PSL23/10441

Client Ref:

23-0343

PSLRF100

Issue No.1

Approved by: L Pavey

03/01/2023

**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT**

22 January 2024

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

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 27/11/2023 and 06/01/2024.

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

Project Name: Dublin Array Onshore Cable Route

Report Reference: Schedule 7 – FINAL

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	5
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	3
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	4
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	3

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 Pro Soils Limited (<i>UKAS 4043</i>)	Thermal Conductivity / Resistivity – (5-point test)	ASTM D5334	1



Project Name

Dublin Array Onshore Cable Route

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

Approved By

Stephen Watson





PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH06

Site Name

Dublin Array Onshore Cable Route

Sample No.

1

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

4.00

Base

Specimen Reference

3

Specimen
Depth

4

m

Sample Type

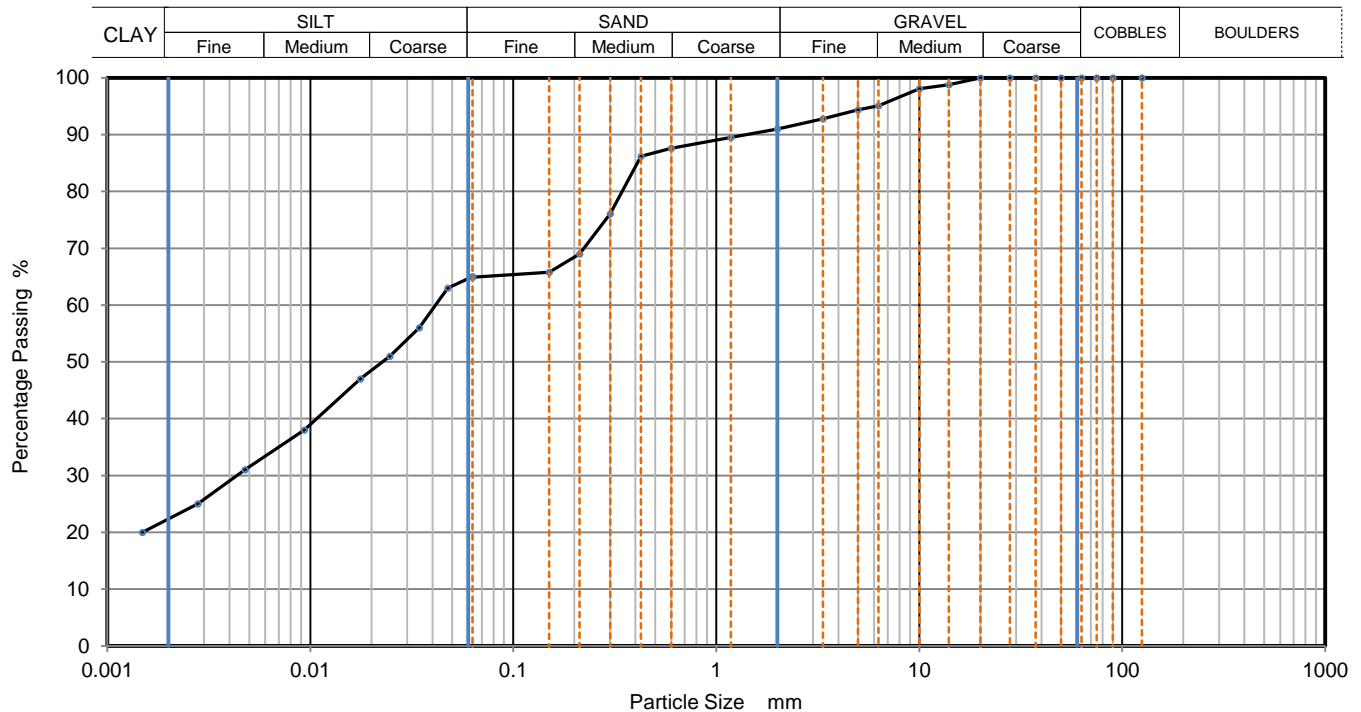
C

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus2023121837



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	65
90	100	0.04762	63
75	100	0.03438	56
63	100	0.02464	51
50	100	0.01766	47
37.5	100	0.00935	38
28	100	0.00476	31
20	100	0.00280	25
14	99	0.00149	20
10	98		
6.3	95		
5	94		
3.35	93		
2	91		
1.18	90		
0.6	88	Particle density (assumed) 2.65 Mg/m ³	
0.425	86		
0.3	76		
0.212	69		
0.15	66		
0.063	65		

Dry Mass of sample, g

453

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	9.0
Sand	26.1
Silt	42.7
Clay	22.2

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

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH06

Site Name

Dublin Array Onshore Cable Route

Sample No.

3

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

6.80

Base

Specimen Reference

2

Specimen
Depth

6.8

m

Sample Type

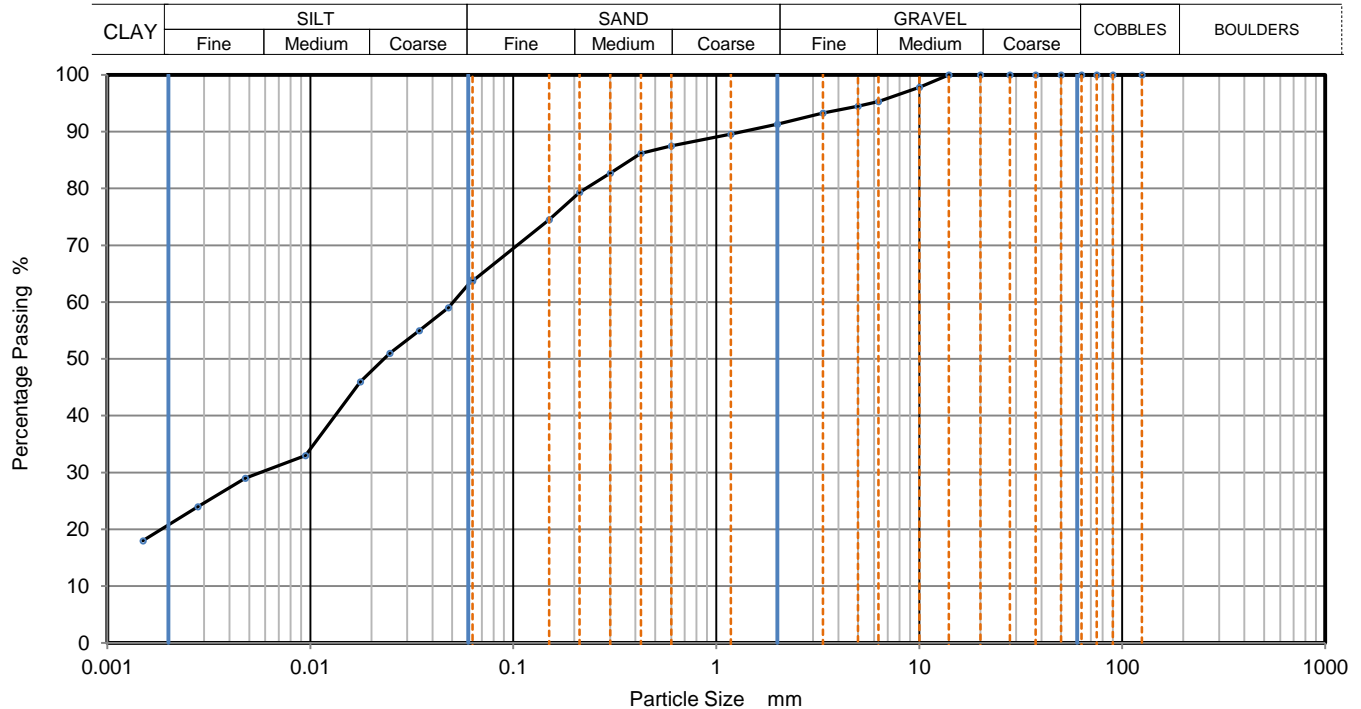
C

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus2023121838



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	64
90	100	0.04796	59
75	100	0.03438	55
63	100	0.02464	51
50	100	0.01766	46
37.5	100	0.00947	33
28	100	0.00479	29
20	100	0.00280	24
14	100	0.00150	18
10	98		
6.3	95		
5	95		
3.35	93		
2	91		
1.18	90		
0.6	88	Particle density (assumed) 2.65 Mg/m3	
0.425	86		
0.3	83		
0.212	79		
0.15	75		
0.063	64		

Dry Mass of sample, g

418

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	8.7
Sand	27.6
Silt	43.1
Clay	20.6

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

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH06

Site Name

Dublin Array Onshore Cable Route

Sample No.

6

Specimen Description

Brown slightly gravelly slightly clayey fine to coarse SAND.

Sample
Depth (m)

Top

11.30

Base

Specimen Reference

1

Specimen
Depth

11.3

m

Sample Type

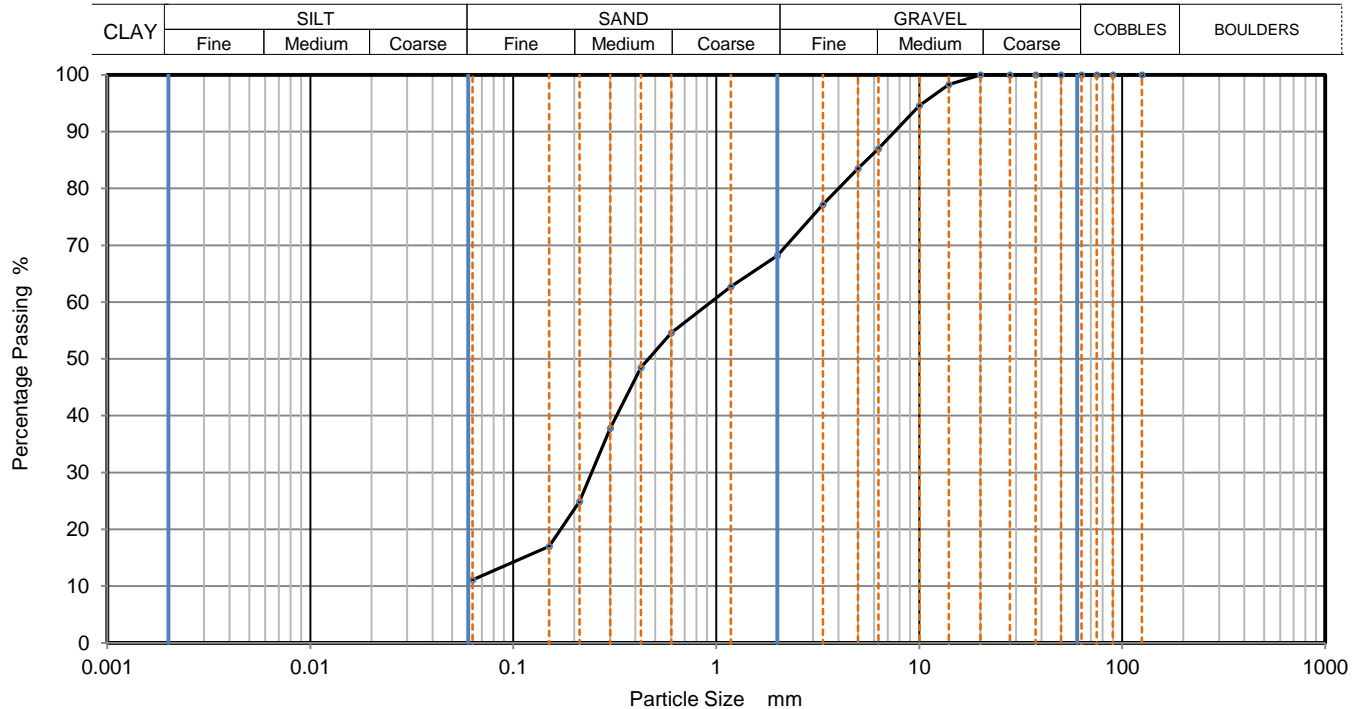
C

Test Method

BS1377:Part 2:1990, clause 9.2

KeyLAB ID

Caus2023121840



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	95		
6.3	87		
5	84		
3.35	77		
2	68		
1.18	63		
0.6	55		
0.425	49		
0.3	38		
0.212	25		
0.15	17		
0.063	11		

Dry Mass of sample, g

500

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	31.8
Sand	57.1
Fines <0.063mm	11.0

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

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



PARTICLE SIZE DISTRIBUTION

Job Ref

23-0343

Borehole/Pit No.

WP03_BH06

Site Name

Dublin Array Onshore Cable Route

Sample No.

11

Specimen Description

Brown sandy slightly gravelly silty CLAY.

Sample
Depth (m)

Top

18.80

Base

Specimen Reference

2

Specimen
Depth

18.8

m

Sample Type

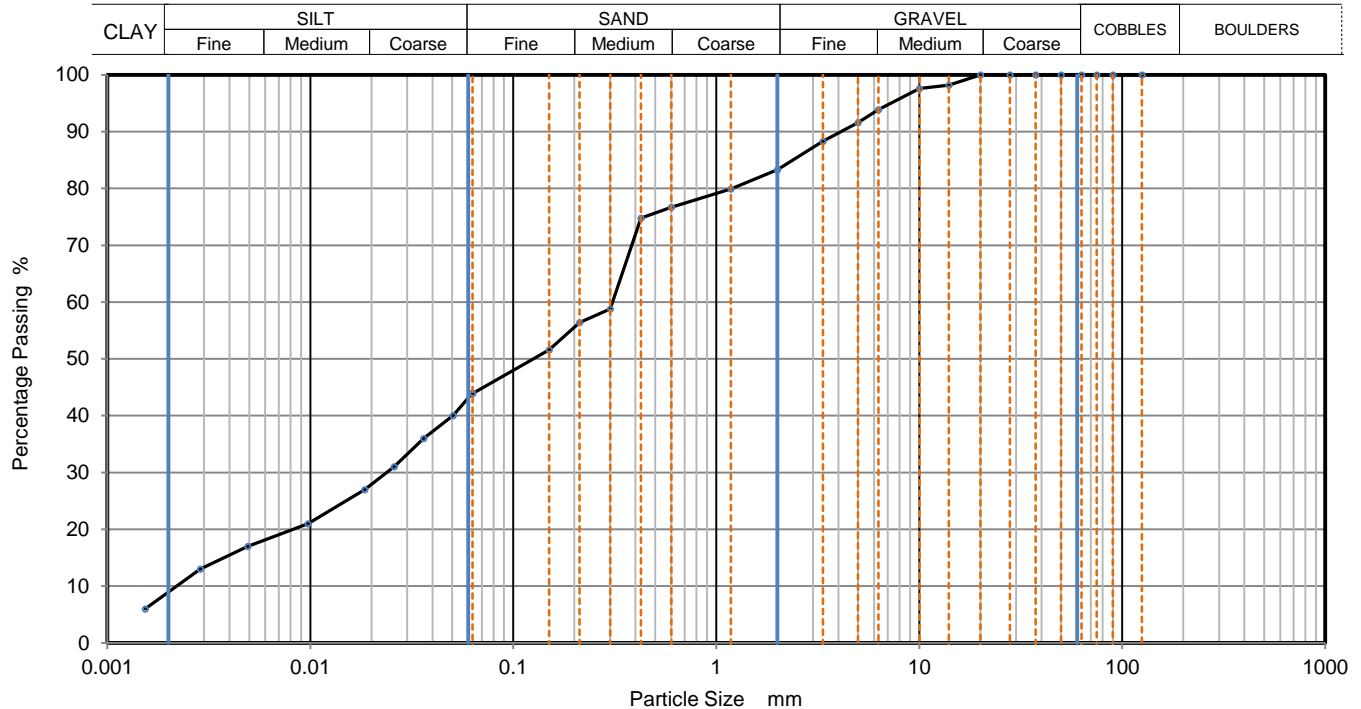
C

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus2023121842



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	44
90	100	0.05058	40
75	100	0.03621	36
63	100	0.02592	31
50	100	0.01855	27
37.5	100	0.00975	21
28	100	0.00493	17
20	100	0.00288	13
14	98	0.00154	6
10	98		
6.3	94		
5	92		
3.35	88		
2	83		
1.18	80		
0.6	77	Particle density (assumed) 2.65 Mg/m3	
0.425	75		
0.3	59		
0.212	56		
0.15	52		
0.063	44		

Dry Mass of sample, g

516

Sample Proportions	% dry mass
Cobbles	0.0
Gravel	16.7
Sand	39.4
Silt	35.0
Clay	8.9

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	140
Curvature Coefficient	0.79

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below



Approved

Stephen Watson

LAB 05R - Version 6

10122



LABORATORY REPORT



Contract Number: PSL24/0227

Report Date: 22 January 2024
Client's Reference: 23-0343
Client Name: Causeway Geotech
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

For the attention of: Stephen Watson

Contract Title: Dublin Array Onshore Cable Route
Date Received: 10/1/2024
Date Commenced: 10/1/2024
Date Completed: 22/1/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Managing Director)

R Berriman
(Associate Director)


S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

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Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WP03_BH06		C	4.80	12.00	Brown gravelly sandy CLAY.



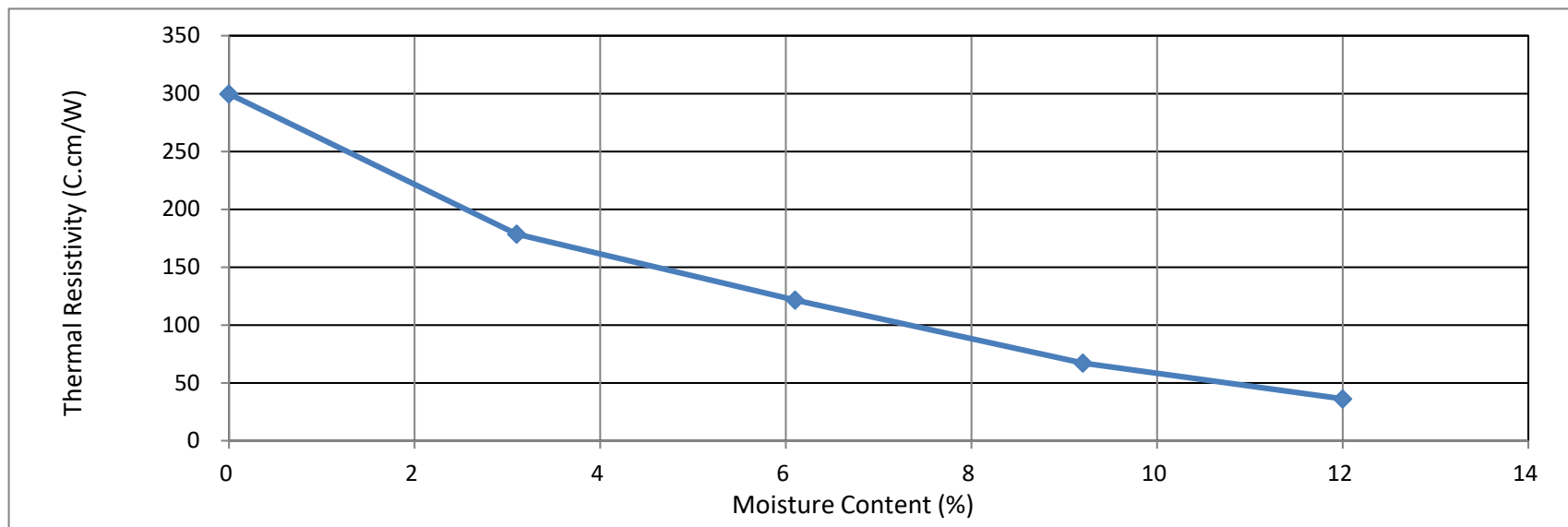
Dublin Array Onshore Cable Route

Contract No:
PSL24/0227
Client Ref:
23-0343

SUMMARY OF THERMAL PROPERTY TESTS

In accordance with ASTM-D5334

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Thermal Conductivity W/m K	Thermal Resistivity C.cm/W	Test Temp C°	Remarks
WP03_BH06		C	4.80	12.00	0.0	1.76	1.76	0.334	299.7	32.1	
WP03_BH06		C	4.80	12.00	3.1	1.76	1.71	0.560	178.5	26.9	
WP03_BH06		C	4.80	12.00	6.1	1.91	1.80	0.824	121.4	20.5	
WP03_BH06		C	4.80	12.00	9.2	1.97	1.80	1.493	67.0	18.8	
WP03_BH06		C	4.80	12.00	12	2.02	1.80	2.762	36.2	14.4	



Dublin Array Onshore Cable Route

Contract No:

PSL24/0227

Client Ref:

23-0343

PSLRF100

Issue No.1

Approved by: L Pavey

03/01/2023

Test Amendment Notice

Causeway

Date:	19.1.24	Stephan Watson
PSL Contract Reference:	PSL 24/0227	
Contract Title:	DUBLIN ARRAY ONSHORE CABLE ROUTE	
Engineer/Client Details:		
Sample Details:	WPO3-BH06 @ 15.30-18.80	
Testing required:	5 POINT THERMAL RESISTIVITY	

Details of Unsuitability

The above sample cannot be performed due to the following reasons:

- 1 The Sample has not been received
- 2 There is insufficient material for the required testing:
 - Sample Mass received (g)
 - Sample Mass required (g)
- 3 The sample has been previously tested
- 4 The sample has been misplaced in the laboratory
- 5 The sample is unsuitable for testing because SAMPLE IS COARSE GRAVEL. NOT POSSIBLE TO PENETRATE WITH PROBE

Please advise action required:

- 1 Perform the testing on the following sample:
- 2 Combine samples has follows for testing:
- 3 Perform the following alternative testing:
- 4 Perform a non standard test:
- 5 Take no further action
- 6 Undertake the following instructions:

Signed

(Project Engineer)

Date



**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT**

4 January 2024

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

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 05/12/2023 and 04/01/2023.

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

Project Name: Dublin Array Onshore Cable Route

Report Reference: Rock Schedule 4

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

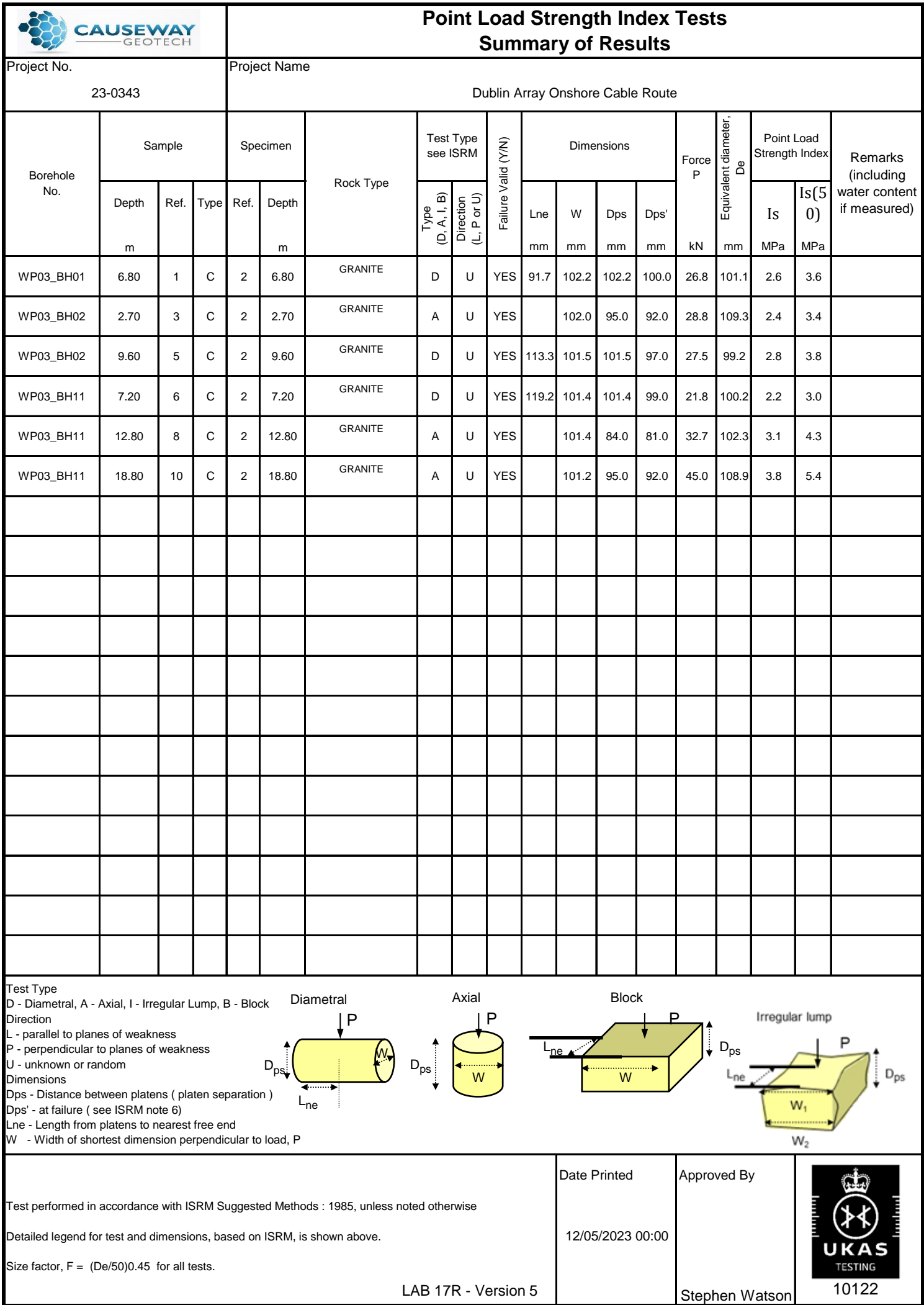
Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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	6

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 (<i>UKAS 2643</i>)	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 14	4
ROCK – subcontracted to GEOLABS (<i>UKAS 2643</i>)	Cerchar Abrasivity Index	ASTM D7625 - 10	3



LABORATORY TEST CERTIFICATE

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 : 23/1262 - 01-1
To : Stephen Watson
Client : Causeway Geotech Limited
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Dublin Array and delivered to our laboratory on 22nd November 2023.

Material & Source

Sample Reference : See Report Plates
Sampled By : Client
Sampling Certificate : Not Supplied
Location : See Report Plates
Description : Rock Cores
Date Sampled : Not Supplied
Date Tested : 22nd November 2023 Onwards
Source : 23-0343 - Dublin Array

Test Results

As Detailed On Page 2 to Page 4 inclusive

Comments

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 should not be reproduced except in full 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

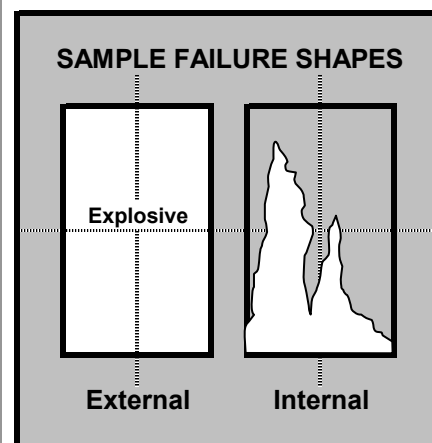
Remarks

Approved for Issue

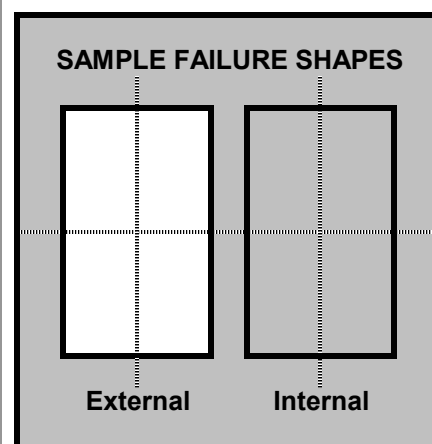

T McLelland (Director)

Date 11/12/2023

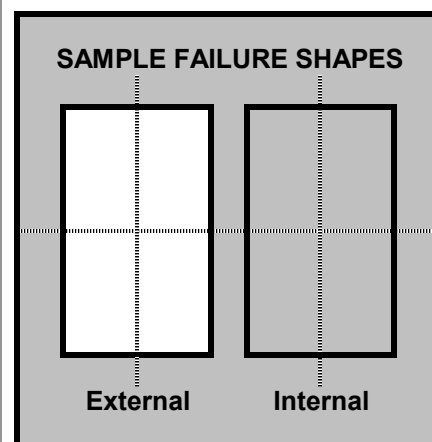
BOREHOLE		WP03_BH01
SAMPLE		C2
DEPTH	m	8.30-8.60
SAMPLE DIAMETER	mm	102.31
SAMPLE HEIGHT	mm	204.92
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.7
TEST DURATION	min.sec	12.58
DATE OF TESTING		08/12/2023
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	526.7
UNCONFINED COMPRESSIVE STRENGTH	MPa	64.1
WATER CONTENT (ISRM Suggested Methods)	%	0.6
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.60
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.59



BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	



BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	



Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

BOREHOLE		WP03_BH02
SAMPLE		C4
DEPTH	m	5.30-5.60
SAMPLE DIAMETER	mm	101.32
SAMPLE HEIGHT	mm	205.41
TEST CONDITION		As Received
RATE OF LOADING	kN/s	1.1
TEST DURATION	min.sec	3.48
DATE OF TESTING		08/12/2023
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	229.6
UNCONFINED COMPRESSIVE STRENGTH	MPa	28.5
WATER CONTENT (ISRM Suggested Methods)	%	0.6
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.62
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.61

SAMPLE FAILURE SHAPES

External Internal

BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

SAMPLE FAILURE SHAPES

External Internal

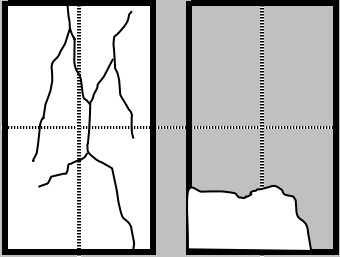
BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

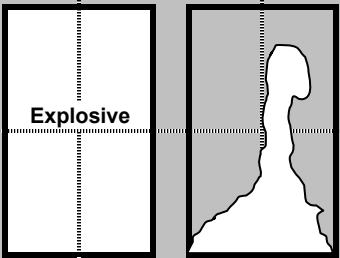
SAMPLE FAILURE SHAPES

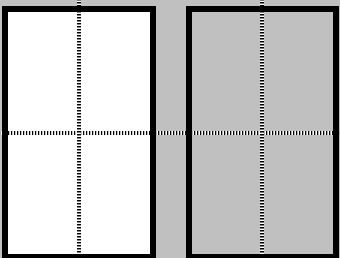
External Internal

Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

BOREHOLE		WP03_BH11	SAMPLE FAILURE SHAPES
SAMPLE		C7	
DEPTH	m	10.50-10.85	
SAMPLE DIAMETER	mm	101.53	
SAMPLE HEIGHT	mm	202.70	External Internal
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	0.6	
TEST DURATION	min.sec	5.49	
DATE OF TESTING		08/12/2023	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	182.8	
UNCONFINED COMPRESSIVE STRENGTH	MPa	22.6	
WATER CONTENT (ISRM Suggested Methods)	%	1.1	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.58	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.55	

BOREHOLE		WP03_BH11	SAMPLE FAILURE SHAPES
SAMPLE		C9	
DEPTH	m	16.50-17.00	
SAMPLE DIAMETER	mm	101.71	
SAMPLE HEIGHT	mm	202.51	External Internal
TEST CONDITION		As Received	
RATE OF LOADING	kN/s	0.6	
TEST DURATION	min.sec	13.19	
DATE OF TESTING		08/12/2023	
LOAD FRAME USED		2000kN	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown	
FAILURE LOAD	kN	506.3	
UNCONFINED COMPRESSIVE STRENGTH	MPa	62.3	
WATER CONTENT (ISRM Suggested Methods)	%	0.4	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.63	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.62	

BOREHOLE			SAMPLE FAILURE SHAPES
SAMPLE			
DEPTH	m		
SAMPLE DIAMETER	mm		
SAMPLE HEIGHT	mm		External Internal
TEST CONDITION			
RATE OF LOADING	kN/s		
TEST DURATION	min.sec		
DATE OF TESTING			
LOAD FRAME USED			
LOAD DIRECTION WITH RESPECT TO LITHOLOGY			
FAILURE LOAD	kN		
UNCONFINED COMPRESSIVE STRENGTH	MPa		
WATER CONTENT (ISRM Suggested Methods)	%		
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³		
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³		

Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

CERCHAR ABRASIVITY

Borehole Ref.: WP03-BH01

Sample Ref.:

Depth (m): 8.30-8.45

Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Slightly to moderately weathered

Sample details

Maximum grain size (mm) 2

Condition as tested As received

Planes of weakness

Direction of stylus No weakness

Surface condition (correction) Rough Sample (no correction needed)

Equipment used*Cerchar apparatus Type 2 (West):*

In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d ₁	mm	0.35	0.34	0.35	0.35	0.34
Measurement d ₂	mm	0.37	0.36	0.37	0.37	0.36
Measurement d ₃	mm	0.35	0.35	0.35	0.35	0.35
Measurement d ₄	mm	0.37	0.35	0.37	0.37	0.35
Measurement d ₅	mm	0.37	0.35	0.37	0.37	0.35
Mean reading d _M	mm	0.36	0.35	0.36	0.36	0.35
Mean pin wear	mm					0.36
CERCHAR-Abrasivity-Index (CAI)						3.56
Standard deviation of CAI						0.05

Classification of CAI

High abrasiveness

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Classification of CAI

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Date tested: 21 December 2023

Photograph**Not required**

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

GEO / 39521

Project Name:

**DUBLIN ARRAY
23/1262-2****GEOLABS**®

CERCHAR ABRASIVITY

Borehole Ref.: WP03-BH02
 Sample Ref.:
 Depth (m): 6.65-6.80

Description:
 Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly weathered

Sample details

Maximum grain size (mm) 2
 Condition as tested As received
 Planes of weakness
 Direction of stylus No weakness
 Surface condition (correction) Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
 In this apparatus the sample moves under a stationary stylus with a specific speed.
Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d ₁	mm	0.38	0.38	0.39	0.39	0.38
Measurement d ₂	mm	0.39	0.39	0.40	0.40	0.39
Measurement d ₃	mm	0.39	0.39	0.40	0.40	0.39
Measurement d ₄	mm	0.40	0.40	0.41	0.41	0.40
Measurement d ₅	mm	0.38	0.38	0.40	0.40	0.38
Mean reading d _M	mm	0.39	0.39	0.40	0.40	0.39
Mean pin wear	mm					0.39
CERCHAR-Abrasivity-Index (CAI)						3.94
Standard deviation of CAI						0.05

Classification of CAI

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Classification of **CAI** **High abrasiveness**

Date tested: 21 December 2023

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

GEO / 39521

Project Name:

**DUBLIN ARRAY
23/1262-2**

GEOLABS®



CERCHAR ABRASIVITY

Borehole Ref.: WP03-BH11
 Sample Ref.:
 Depth (m): 12.80-12.90

Description:
 Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly weathered

Sample details

Maximum grain size (mm) 2
 Condition as tested As received
 Planes of weakness
 Direction of stylus No weakness
 Surface condition (correction) Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
 In this apparatus the sample moves under a stationary stylus with a specific speed.
Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d ₁	mm	0.39	0.39	0.40	0.39	0.39
Measurement d ₂	mm	0.40	0.40	0.41	0.40	0.39
Measurement d ₃	mm	0.40	0.40	0.41	0.40	0.39
Measurement d ₄	mm	0.41	0.41	0.42	0.41	0.40
Measurement d ₅	mm	0.39	0.39	0.41	0.39	0.40
Mean reading d _M	mm	0.40	0.40	0.41	0.40	0.39
Mean pin wear	mm					0.40
CERCHAR-Abrasivity-Index (CAI)						4.00
Standard deviation of CAI						0.07

Classification of CAI

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Classification of **CAI** **High abrasiveness**

Date tested: 21 December 2023

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

GEO / 39521

Project Name:

DUBLIN ARRAY
23/1262-2

GEOLABS®



**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT**

4 January 2024

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

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 05/12/2023 and 04/01/2023.

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

Project Name: Dublin Array Onshore Cable Route

Report Reference: Rock Schedule 5

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

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. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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	4

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 (<i>UKAS 2643</i>)	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 14	1
ROCK – subcontracted to GEOLABS (<i>UKAS 2643</i>)	Cerchar Abrasivity Index	ASTM D7625 - 10	2

Point Load Strength Index Tests

Summary of Results

Project No.

23-0343

Project Name

Dublin Array Onshore Cable Route

[illegible]

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

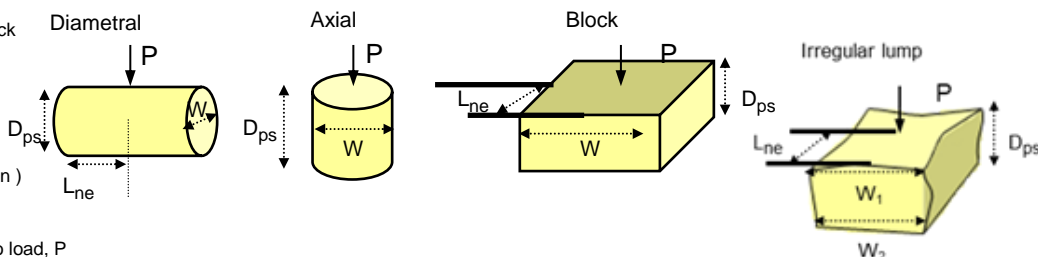
Dimensions

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.

Date Printed

12/05/2023 00:00

Approved By _____

Stephen Watson



10122

LABORATORY TEST CERTIFICATE

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 : 23/1262 - 01-2
To : Stephen Watson
Client : Causeway Geotech Limited
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Dublin Array and delivered to our laboratory on 22nd November 2023.

Material & Source

Sample Reference : See Report Plates
Sampled By : Client
Sampling Certificate : Not Supplied
Location : See Report Plates
Description : Rock Cores
Date Sampled : Not Supplied
Date Tested : 22nd November 2023 Onwards
Source : 23-0343 - Dublin Array

Test Results


As Detailed On Page 2

Comments

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 should not be reproduced except in full 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 11/12/2023

BOREHOLE		WP03_BH10A
SAMPLE		C5
DEPTH	m	20.00-20.30
SAMPLE DIAMETER	mm	101.89
SAMPLE HEIGHT	mm	207.07
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.5
TEST DURATION	min.sec	6.51
DATE OF TESTING		08/12/2023
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	209.0
UNCONFINED COMPRESSIVE STRENGTH	MPa	25.6
WATER CONTENT (ISRM Suggested Methods)	%	0.5
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.63
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.62

SAMPLE FAILURE SHAPES

External Internal

BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

SAMPLE FAILURE SHAPES

External Internal

BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

SAMPLE FAILURE SHAPES

External Internal

Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

CERCHAR ABRASIVITY

Borehole Ref.: WP03-BH10A
 Sample Ref.:
 Depth (m): 10.60-10.75

Description:
 Strong grey, white and greenish grey IGNEOUS ROCK. Slightly to moderately weathered

Sample details

Maximum grain size (mm) 2
 Condition as tested As received
 Planes of weakness
 Direction of stylus No weakness
 Surface condition (correction) Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
 In this apparatus the sample moves under a stationary stylus with a specific speed.
Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d ₁	mm	0.35	0.35	0.35	0.35	0.35
Measurement d ₂	mm	0.36	0.36	0.36	0.36	0.36
Measurement d ₃	mm	0.36	0.36	0.36	0.36	0.36
Measurement d ₄	mm	0.37	0.37	0.37	0.37	0.37
Measurement d ₅	mm	0.35	0.35	0.35	0.35	0.35
Mean reading d _M	mm	0.36	0.36	0.36	0.36	0.36
Mean pin wear	mm					0.36
CERCHAR-Abrasivity-Index (CAI)						3.60
Standard deviation of CAI						0.00
Classification of CAI						High abrasiveness

Classification of CAI

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Date tested: 21 December 2023

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Photograph**Not required**

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

GEO / 39521

Project Name:

**DUBLIN ARRAY
23/1262-2****GEOLABS®**

CERCHAR ABRASIVITY

Borehole Ref.: WP03-BH10A

Sample Ref.:

Depth (m): 15.80-16.10

Description:

Strong grey, white and greenish grey IGNEOUS ROCK. Slightly to moderately weathered

Sample details

Maximum grain size (mm) 2

Condition as tested As received

Planes of weakness

Direction of stylus No weakness

Surface condition (correction) Rough Sample (no correction needed)

Equipment used*Cerchar apparatus Type 2 (West):*

In this apparatus the sample moves under a stationary stylus with a specific speed.

Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d ₁	mm	0.36	0.36	0.36	0.36	0.36
Measurement d ₂	mm	0.37	0.36	0.37	0.37	0.36
Measurement d ₃	mm	0.37	0.36	0.37	0.37	0.36
Measurement d ₄	mm	0.38	0.37	0.38	0.38	0.37
Measurement d ₅	mm	0.36	0.37	0.36	0.36	0.37
Mean reading d _M	mm	0.37	0.36	0.37	0.37	0.36
Mean pin wear	mm					0.37
CERCHAR-Abrasivity-Index (CAI)						3.66
Standard deviation of CAI						0.05
Classification of CAI						High abrasiveness

Classification of CAI

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Date tested: 21 December 2023

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Photograph**Not required**

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

GEO / 39521

Project Name:

**DUBLIN ARRAY
23/1262-2****GEOLABS**®

**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT**

12 January 2024

Project Name:	Dublin Array Onshore Cable Route
Project No.:	23-0343
Client:	Dublin Array
Engineer:	GDG

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 05/12/2023 and 04/01/2023.

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

Project Name: Dublin Array Onshore Cable Route

Report Reference: Rock Schedule 7

The table below details the tests carried out, the specifications used, and the number of tests included in this report. The results contained in this report relate to the sample(s) as received.

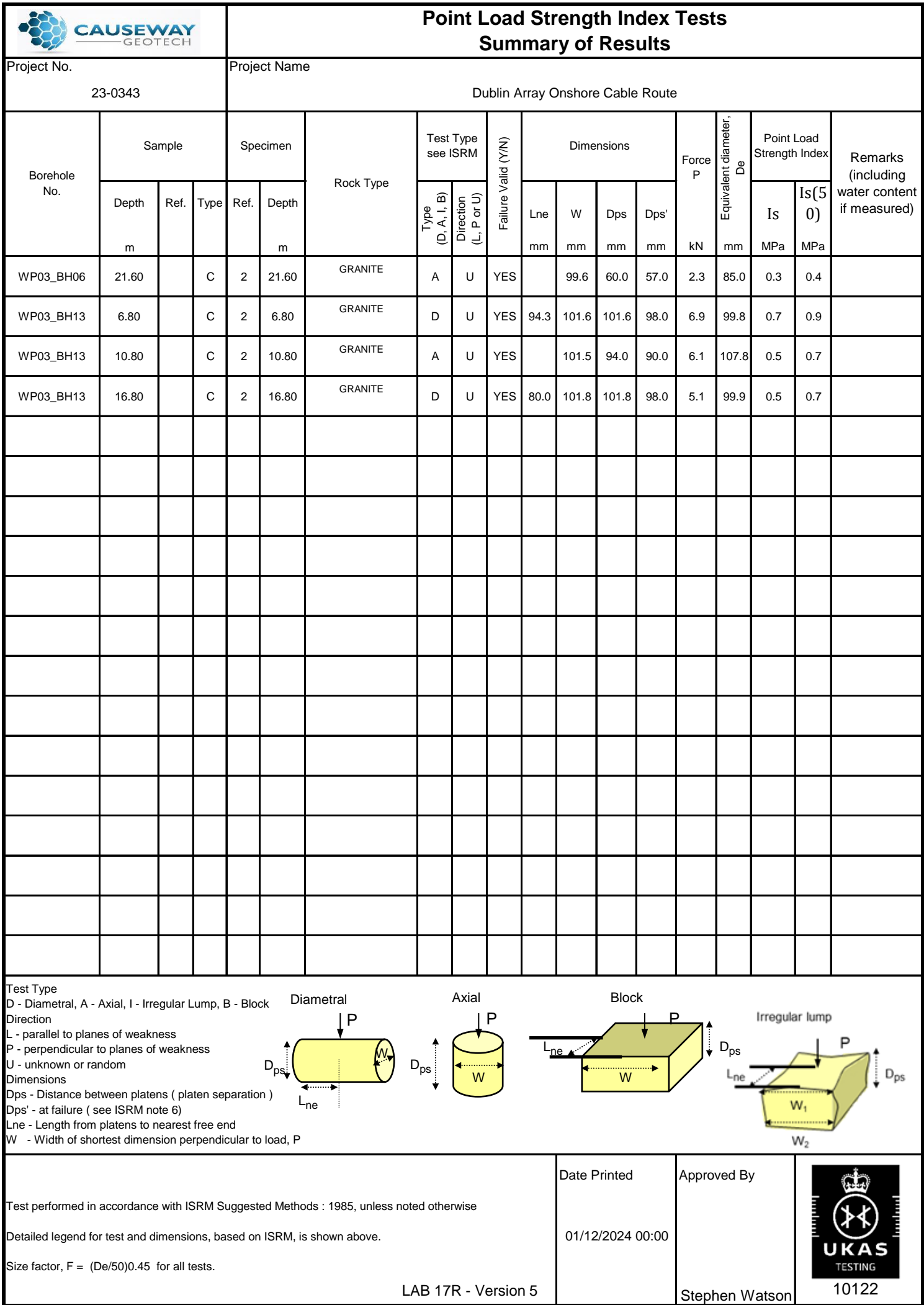
Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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	4

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 (<i>UKAS 2643</i>)	Uniaxial Compressive Strength (UCS)	ASTM D7012 - 14	2
ROCK – subcontracted to GEOLABS (<i>UKAS 2643</i>)	Cerchar Abrasivity Index	ASTM D7625 - 10	3



LABORATORY TEST CERTIFICATE

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 : 23/1262 - 03-1
To : Stephen Watson
Client : Causeway Geotech Limited
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Dublin Array and delivered to our laboratory on 08th January 2024.

Material & Source

Sample Reference : See Report Plate
Sampled By : Client
Sampling Certificate : Not Supplied
Location : See Report Plate
Description : Rock Cores
Date Sampled : Not Supplied
Date Tested : 08th January 2024 Onwards
Source : 23-0343 - Dublin Array

Test Results

As Detailed On Page 2

Comments

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 should not be reproduced except in full 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

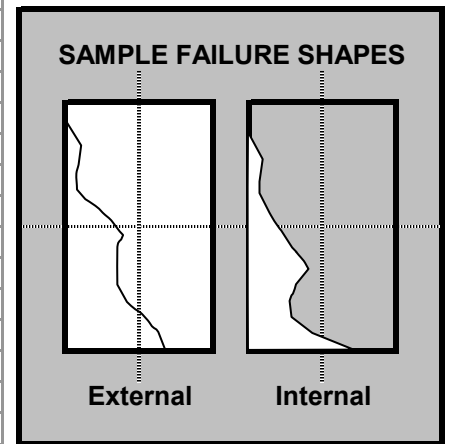
Remarks

Approved for Issue


T McLelland (Director)

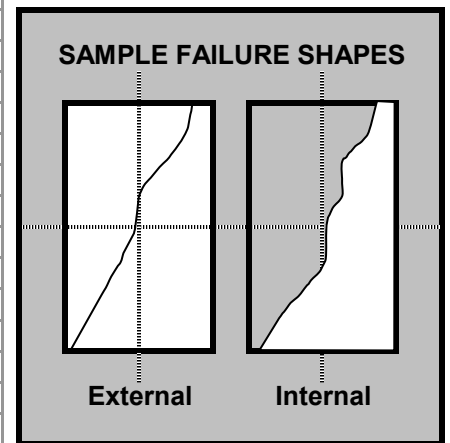
Date 12/01/2024

BOREHOLE		WP03_BH13
SAMPLE		C
DEPTH	m	14.30-14.50
SAMPLE DIAMETER	mm	101.51
SAMPLE HEIGHT	mm	160.26
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.5
TEST DURATION	min.sec	5.30
DATE OF TESTING		12/01/2024
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	163.5
UNCONFINED COMPRESSIVE STRENGTH	MPa	20.2
WATER CONTENT (ISRM Suggested Methods)	%	0.8
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.57
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.55



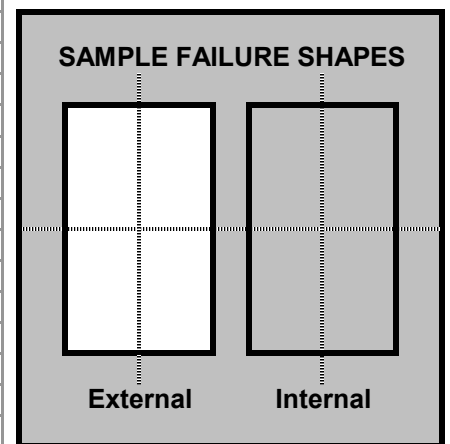
Test specimen does not meet specified length / diameter ratio requirements

BOREHOLE		WP03_BH13
SAMPLE		C
DEPTH	m	18.80-19.10
SAMPLE DIAMETER	mm	101.40
SAMPLE HEIGHT	mm	184.36
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.4
TEST DURATION	min.sec	3.20
DATE OF TESTING		12/01/2024
LOAD FRAME USED		2000kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	83.9
UNCONFINED COMPRESSIVE STRENGTH	MPa	10.4
WATER CONTENT (ISRM Suggested Methods)	%	1.7
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.70
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.65



Test specimen does not meet specified length / diameter ratio requirements

BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	



Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

CERCHAR ABRASIVITY

Borehole Ref.: WP03-BH06
 Sample Ref.:
 Depth (m): 21.70-21.80

Description:
 Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly weathered

Sample details

Maximum grain size (mm) 2
 Condition as tested As received
 Planes of weakness
 Direction of stylus No weakness
 Surface condition (correction) Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
 In this apparatus the sample moves under a stationary stylus with a specific speed.
Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d ₁	mm	0.40	0.40	0.40	0.40	0.38
Measurement d ₂	mm	0.40	0.40	0.41	0.40	0.40
Measurement d ₃	mm	0.40	0.40	0.41	0.40	0.38
Measurement d ₄	mm	0.41	0.41	0.42	0.41	0.40
Measurement d ₅	mm	0.41	0.41	0.40	0.41	0.40
Mean reading d _M	mm	0.40	0.40	0.41	0.40	0.39
Mean pin wear	mm					0.40
CERCHAR-Abrasivity-Index (CAI)						4.00
Standard deviation of CAI						0.07

Classification of CAI

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Classification of **CAI** **High abrasiveness**

Date tested: 21 December 2023

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

GEO / 39521

Project Name:

DUBLIN ARRAY
23/1262-2

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CERCHAR ABRASIVITY

Borehole Ref.: WP03-BH13
 Sample Ref.:
 Depth (m): 9.50-9.80

Description:
 Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly weathered

Sample details

Maximum grain size (mm) 2
 Condition as tested As received
 Planes of weakness
 Direction of stylus No weakness
 Surface condition (correction) Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
 In this apparatus the sample moves under a stationary stylus with a specific speed.
Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d ₁	mm	0.41	0.38	0.41	0.41	0.38
Measurement d ₂	mm	0.41	0.40	0.41	0.41	0.40
Measurement d ₃	mm	0.41	0.39	0.41	0.41	0.39
Measurement d ₄	mm	0.42	0.39	0.42	0.42	0.39
Measurement d ₅	mm	0.42	0.39	0.42	0.42	0.39
Mean reading d _M	mm	0.41	0.39	0.41	0.41	0.39
Mean pin wear	mm					0.40
CERCHAR-Abrasivity-Index (CAI)						4.02
Standard deviation of CAI						0.11

Classification of CAI

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Classification of **CAI** **Extreme abrasiveness**

Date tested: 21 December 2023

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

GEO / 39521

Project Name:

**DUBLIN ARRAY
23/1262-2**

GEOLABS®



CERCHAR ABRASIVITY

Borehole Ref.: WP03-BH13
 Sample Ref.:
 Depth (m): 18.65-18.80

Description:
 Strong grey, white and greenish grey IGNEOUS ROCK. Fresh to slightly weathered

Sample details

Maximum grain size (mm) 2
 Condition as tested As received
 Planes of weakness
 Direction of stylus No weakness
 Surface condition (correction) Rough Sample (no correction needed)

Equipment used

Cerchar apparatus Type 2 (West):
 In this apparatus the sample moves under a stationary stylus with a specific speed.
Stylus: Made of steel with a Rockwell Hardness of HRC 55±1.

Test No.		1	2	3	4	5
Measurement d ₁	mm	0.42	0.39	0.40	0.40	0.39
Measurement d ₂	mm	0.42	0.41	0.42	0.42	0.41
Measurement d ₃	mm	0.42	0.40	0.40	0.40	0.40
Measurement d ₄	mm	0.43	0.40	0.42	0.42	0.40
Measurement d ₅	mm	0.43	0.40	0.42	0.42	0.40
Mean reading d _M	mm	0.42	0.40	0.41	0.41	0.40
Mean pin wear	mm					0.41
CERCHAR-Abrasivity-Index (CAI)						4.08
Standard deviation of CAI						0.08

Classification of CAI

<0.30	Extremely low
0.30-0.50	Very low
0.50-1.00	Low
1.00-2.00	Medium
2.00-4.00	High
4.00-6.00	Extreme
6.00-7.00	Quartzitic

Classification of **CAI** **Extreme abrasiveness**

Date tested: 21 December 2023

*Measurements done under >50x magnification calibrated microscope. Using top and side view

Photograph

Not required

Checked and Approved by

IT

I Tabios (Head of Department)

Date: 04/01/2024

Project Number:

GEO / 39521

Project Name:

**DUBLIN ARRAY
23/1262-2**

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CAUSEWAY
— GEOTECH

APPENDIX G
ENVIRONMENTAL LABORATORY TEST RESULTS





Certificate of Analysis

Certificate Number 23-22937

Issued: 19-Oct-23

Client Causeway Geotech
Unit 1 Fingal House
Stephenstown Industrial Estate
Balbriggan
Co. Dublin
K32 VR66

Our Reference 23-22937

Client Reference 23-0343

Order No (not supplied)

Contract Title RWE Dublin Array GPR Survey

Description 4 Soil samples, 4 Leachate samples.

Date Received 26-Sep-23

Date Started 26-Sep-23

Date Completed 19-Oct-23

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

Kirk Bridgewood
General Manager



2139

Summary of Chemical Analysis

Soil Samples

Our Ref 23-22937

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	2239173	2239174	2239175	2239176
Sample ID	WP03 TP05	WP03 TP07	WP03 TP08	WP03 TP02
Depth	0.50	0.50	0.50	1.50
Other ID	1	1	1	1
Sample Type	ES	ES	ES	ES
Sampling Date	11/09/2023	11/09/2023	11/09/2023	12/09/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Preparation							
Moisture Content	DETSC 1004	0.1	%	8.8	7.7	11	4.1
Metals							
Antimony	DETSC 2301*	1	mg/kg	1.8	1.3	1.2	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	18	12	13	4.4
Barium	DETSC 2301#	1.5	mg/kg	75	55	63	120
Beryllium	DETSC 2301#	0.2	mg/kg	0.8	0.6	0.6	0.4
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.4	< 0.2	0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	1.9	1.0	1.6	< 0.1
Chromium	DETSC 2301#	0.15	mg/kg	18	16	12	38
Chromium III	DETSC 2301*	0.15	mg/kg	18	16	12	38
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	35	25	22	21
Lead	DETSC 2301#	0.3	mg/kg	68	30	19	5.1
Mercury	DETSC 2325#	0.05	mg/kg	0.08	0.17	0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	3.0	1.6	1.6	< 0.4
Nickel	DETSC 2301#	1	mg/kg	31	26	25	26
Selenium	DETSC 2301#	0.5	mg/kg	1.6	1.2	1.0	< 0.5
Zinc	DETSC 2301#	1	mg/kg	100	69	71	33
Inorganics							
pH	DETSC 2008#		pH	8.2	8.5	8.7	7.9
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	1.6	0.6	1.1	< 0.5
Organic matter	DETSC 2002#	0.1	%	0.5	0.6	1.2	0.2
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.3	2.7	4.1	8.0
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076*	10	%	< 10	< 10	< 10	< 10
Petroleum Hydrocarbons							
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Summary of Chemical Analysis Soil Samples

Our Ref 23-22937

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	2239173	2239174	2239175	2239176
Sample ID	WP03 TP05	WP03 TP07	WP03 TP08	WP03 TP02
Depth	0.50	0.50	0.50	1.50
Other ID	1	1	1	1
Sample Type	ES	ES	ES	ES
Sampling Date	11/09/2023	11/09/2023	11/09/2023	12/09/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
EPH (C10-C40): EH_1D_Total	DETSC 3311#	10	mg/kg	26	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	0.08	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	0.07	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.04	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	0.05	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.03	< 0.03	0.06	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.04	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10	0.34	< 0.10
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis

Leachate Samples

Our Ref 23-22937

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	2239177	2239178	2239179	2239180
Sample ID	WP03 TP05	WP03 TP07	WP03 TP08	WP03 TP02
Depth	0.50	0.50	0.50	1.50
Other ID	1	1	1	1
Sample Type	ES	ES	ES	ES
Sampling Date	11/09/2023	11/09/2023	11/09/2023	12/09/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Preparation							
NRA Leachate Preparation	DETSC 1009*			Y	Y	Y	Y
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.3	1.3	0.74	11
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	18	9.6	11	13
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.39	< 0.25	< 0.25	18
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	9.1
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.4	0.9	1.3	1.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.24	0.12	0.19	0.15
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.4	0.48	0.58	4.7
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	0.7	< 0.6	1.1
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3	< 1.3	< 1.3
Inorganics							
pH	DETSC 2008		pH	8.0	8.8	8.7	9.0
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Dissolved Organic Carbon	DETSC 2085	2	mg/l	2.6	2.2	2.7	2.4
Total Hardness as CaCO3	DETSC 2303	0.1	mg/l	49.9	25.8	29.9	33.5
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.15	0.088	0.025	0.031
Chloride	DETSC 2055	0.1	mg/l	9.1	6.5	1.5	3.0
Sulphate as SO4	DETSC 2055	0.1	mg/l	16	3.7	3.6	12
Sulphide	DETSC 2208	10	ug/l	14	14	16	10
Petroleum Hydrocarbons							
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0

Summary of Chemical Analysis

Leachate Samples

Our Ref 23-22937

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	2239177	2239178	2239179	2239180
Sample ID	WP03 TP05	WP03 TP07	WP03 TP08	WP03 TP02
Depth	0.50	0.50	0.50	1.50
Other ID	1	1	1	1
Sample Type	ES	ES	ES	ES
Sampling Date	11/09/2023	11/09/2023	11/09/2023	12/09/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
PAHs							
Naphthalene	DETSC 3304	0.05	ug/l	0.05	< 0.05	< 0.05	0.12
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.04
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	< 0.01	0.01	0.16
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.03
Fluoranthene	DETSC 3304	0.01	ug/l	0.02	0.01	0.03	0.08
Pyrene	DETSC 3304	0.01	ug/l	0.02	0.01	0.03	0.07
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	0.02	0.02
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	0.01	0.02	0.02
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.03	0.03
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	0.02
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.01	0.02	0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	0.03
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	0.04
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	0.20	0.70
Phenols							
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100	< 100	< 100

Summary of Asbestos Analysis Soil Samples

Our Ref 23-22937

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2239173	WP03 TP05 1 0.50	SOIL	NAD	none	Barry Kelly
2239174	WP03 TP07 1 0.50	SOIL	NAD	none	Barry Kelly
2239175	WP03 TP08 1 0.50	SOIL	NAD	none	Barry Kelly
2239176	WP03 TP02 1 1.50	SOIL	NAD	none	Barry Kelly

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-22937
 Client Ref 23-0343
 Contract RWE Dublin Array GPR Survey

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2239173	WP03 TP05 0.50 SOIL	11/09/23	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2239174	WP03 TP07 0.50 SOIL	11/09/23	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2239175	WP03 TP08 0.50 SOIL	11/09/23	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2239176	WP03 TP02 1.50 SOIL	12/09/23	GJ 250ml, GJ 60ml, PT 1L x2	pH + Conductivity (7 days)	
2239177	WP03 TP05 0.50 LEACHATE	11/09/23	GJ 250ml, GJ 60ml, PT 1L		
2239178	WP03 TP07 0.50 LEACHATE	11/09/23	GJ 250ml, GJ 60ml, PT 1L		
2239179	WP03 TP08 0.50 LEACHATE	11/09/23	GJ 250ml, GJ 60ml, PT 1L		
2239180	WP03 TP02 1.50 LEACHATE	12/09/23	GJ 250ml, GJ 60ml, PT 1L x2		

Key: G-Glass P-Plastic J-Jar 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

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C35-C40	EH_CU_1D_AL
Aliphatic C5-C40	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C35-C40	EH_CU_1D_AR
Aromatic C5-C40	EH_CU+HS_1D_AR
TPH Ali/Aro C5-C40	EH_CU+HS_1D_Total
EPH (C10-C40)	EH_1D_Total

End of Report



Certificate of Analysis

Certificate Number 23-25553-0

Issued: 13-Nov-23

Client Causeway Geotech
Unit 1 Fingal House
Stephenstown Industrial Estate
Balbriggan
Co. Dublin
K32 VR66

Our Reference 23-25553-0

Client Reference 23-0343

Order No (not supplied)

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Description One Soil sample.

Date Received 30-Oct-23

Date Started 30-Oct-23

Date Completed 13-Nov-23

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

Notes This report supersedes 23-25553, amendments made

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

Kirk Bridgewood
General Manager



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Summary of Chemical Analysis

Soil Samples

Our Ref 23-25553-0

Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2254866
Sample ID	WP03_TP04
Depth	A
Other ID	1.40
Sample Type	1
Sampling Date	SOIL
Sampling Time	10/10/2023
	n/s

Test	Method	LOD	Units	
Preparation				
Moisture Content	DETSC 1004	0.1	%	12
Metals				
Antimony	DETSC 2301*	1	mg/kg	1.2
Arsenic	DETSC 2301#	0.2	mg/kg	17
Barium	DETSC 2301#	1.5	mg/kg	54
Beryllium	DETSC 2301#	0.2	mg/kg	0.6
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.6
Cadmium	DETSC 2301#	0.1	mg/kg	1.2
Chromium	DETSC 2301#	0.15	mg/kg	13
Chromium III	DETSC 2301*	0.15	mg/kg	13
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	21
Lead	DETSC 2301#	0.3	mg/kg	18
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.9
Nickel	DETSC 2301#	1	mg/kg	27
Selenium	DETSC 2301#	0.5	mg/kg	1.0
Zinc	DETSC 2301#	1	mg/kg	74
Inorganics				
pH	DETSC 2008#		pH	8.1
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1
Total Organic Carbon	DETSC 2084#	0.5	%	0.8
Organic matter	DETSC 2002#	0.1	%	1.1
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.9
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076*	10	%	< 10
Petroleum Hydrocarbons				
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	3.4	mg/kg	< 3.4
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9

Summary of Chemical Analysis

Soil Samples

Our Ref 23-25553-0

Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2254866
Sample ID	WP03_TP04
Depth	A
Other ID	1.40
Sample Type	1
Sampling Date	SOIL
Sampling Time	10/10/2023
	n/s

Test	Method	LOD	Units	
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1.4	mg/kg	< 1.4
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10
EPH (C10-C40): EH_1D_Total	DETSC 3311#	10	mg/kg	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01
PAHs				
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10
Phenols				
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3

Summary of Asbestos Analysis Soil Samples

Our Ref 23-25553-0

Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2254866	WP03_TP04A 1 1.40	SOIL	NAD	none	Ben Barsby

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-25553-0
 Client Ref 23-0343
 Contract RWE DUBLIN ARRAY GPR SURVEY

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2254866	WP03_TP04A 1.40 SOIL	10/10/23	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	

Key: G-Glass P-Plastic J-Jar T-Tub

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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

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C35-C40	EH_CU_1D_AL
Aliphatic C5-C40	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C35-C40	EH_CU_1D_AR
Aromatic C5-C40	EH_CU+HS_1D_AR
TPH Ali/Aro C5-C40	EH_CU+HS_1D_Total
EPH (C10-C40)	EH_1D_Total

End of Report



Certificate of Analysis

Certificate Number 23-25931

Issued: 15-Nov-23

Client Causeway Geotech
Unit 1 Fingal House
Stephenstown Industrial Estate
Balbriggan
Co. Dublin
K32 VR66

Our Reference 23-25931

Client Reference 23-0343

Order No (not supplied)

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Description 2 Soil samples, 2 Leachate samples.

Date Received 02-Nov-23

Date Started 02-Nov-23

Date Completed 15-Nov-23

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

A handwritten signature in black ink, appearing to read "K. Bridgewood".

Kirk Bridgewood
General Manager



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Summary of Chemical Analysis

Soil Samples

Our Ref 23-25931

Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2257364	2257365
Sample ID	WP03-BH07	WP03-BH07
Depth	1.00	5.50
Other ID	2	7
Sample Type	ES	ES
Sampling Date	18/10/2023	19/10/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Preparation					
Moisture Content	DETSC 1004	0.1	%	15	11
Metals					
Antimony	DETSC 2301*	1	mg/kg	1.1	1.2
Arsenic	DETSC 2301#	0.2	mg/kg	13	16
Barium	DETSC 2301#	1.5	mg/kg	50	11
Beryllium	DETSC 2301#	0.2	mg/kg	0.6	0.4
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.9	0.2
Chromium	DETSC 2301#	0.15	mg/kg	18	20
Chromium III	DETSC 2301*	0.15	mg/kg	18	20
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	20	33
Lead	DETSC 2301#	0.3	mg/kg	16	11
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.3	< 0.4
Nickel	DETSC 2301#	1	mg/kg	26	24
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	66	71
Inorganics					
pH	DETSC 2008#		pH	8.2	8.6
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	0.6	< 0.5
Organic matter	DETSC 2002#	0.1	%	0.5	0.8
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.8	5.4
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076*	10	%	< 10	< 10
Petroleum Hydrocarbons					
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	0.02	0.02
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	0.66	0.67
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9

Summary of Chemical Analysis

Soil Samples

Our Ref 23-25931

Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2257364	2257365
Sample ID	WP03-BH07	WP03-BH07
Depth	1.00	5.50
Other ID	2	7
Sample Type	ES	ES
Sampling Date	18/10/2023	19/10/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	< 10
EPH (C10-C40): EH_1D_Total	DETSC 3311#	10	mg/kg	48	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

Summary of Chemical Analysis

Leachate Samples

Our Ref 23-25931

Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2257366	2257367
Sample ID	WP03-BH07	WP03-BH07
Depth	1.00	5.50
Other ID	2	7
Sample Type	ES	ES
Sampling Date	18/10/2023	19/10/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Preparation					
NRA Leachate Preparation	DETSC 1009*			Y	Y
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.87	1.5
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	11	6.6
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	0.9	0.9
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	0.45
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	1.8
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	0.8	0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	1.6
Inorganics					
pH	DETSC 2008		pH	7.5	6.8
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Dissolved Organic Carbon	DETSC 2085	2	mg/l	2.2	< 2.0
Total Hardness as CaCO3	DETSC 2303	0.1	mg/l	29.8	18.5
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	< 0.015	< 0.015
Chloride	DETSC 2055	0.1	mg/l	1.4	0.70
Sulphate as SO4	DETSC 2055	0.1	mg/l	3.9	3.4
Sulphide	DETSC 2208	10	ug/l	24	24
Petroleum Hydrocarbons					
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	ug/l	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0

Summary of Chemical Analysis

Leachate Samples

Our Ref 23-25931

Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	2257366	2257367
Sample ID	WP03-BH07	WP03-BH07
Depth	1.00	5.50
Other ID	2	7
Sample Type	ES	ES
Sampling Date	18/10/2023	19/10/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	ug/l	< 10	< 10
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0
MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0
PAHs					
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.01	0.03
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.01	0.32
Pyrene	DETSC 3304	0.01	ug/l	0.01	0.27
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	< 0.01	0.11
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	0.12
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.13
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.05
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.11
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.08
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.02
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	0.09
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	1.4
Phenols					
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100

Summary of Asbestos Analysis Soil Samples

Our Ref 23-25931

Client Ref 23-0343

Contract Title RWE DUBLIN ARRAY GPR SURVEY

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2257364	WP03-BH07 2 1.00	SOIL	NAD	none	Ben Rose
2257365	WP03-BH07 7 5.50	SOIL	NAD	none	Ben Rose

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-25931
 Client Ref 23-0343
 Contract RWE DUBLIN ARRAY GPR SURVEY

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2257364	WP03-BH07 1.00 SOIL	18/10/23	GJ 250ml, GJ 60ml, PT 1L x2	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH MS (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), EPH/TPH (14 days)	
2257365	WP03-BH07 5.50 SOIL	19/10/23	GJ 250ml, GJ 60ml, PT 1L x2	pH + Conductivity (7 days)	
2257366	WP03-BH07 1.00 LEACHATE	18/10/23	GJ 250ml, GJ 60ml, PT 1L x2		
2257367	WP03-BH07 5.50 LEACHATE	19/10/23	GJ 250ml, GJ 60ml, PT 1L x2		

Key: G-Glass P-Plastic J-Jar 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

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C35-C40	EH_CU_1D_AL
Aliphatic C5-C40	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C35-C40	EH_CU_1D_AR
Aromatic C5-C40	EH_CU+HS_1D_AR
TPH Ali/Aro C5-C40	EH_CU+HS_1D_Total
EPH (C10-C40)	EH_1D_Total

End of Report



Certificate of Analysis

Certificate Number 23-27489

Issued: 06-Dec-23

Client Causeway Geotech
Unit 1 Fingal House
Stephenstown Industrial Estate
Balbriggan
Co. Dublin
K32 VR66

Our Reference 23-27489

Client Reference 23-0343

Order No (not supplied)

Contract Title RWE Dublin Array GPR Survey

Description 2 Soil samples, 2 Leachate prepared by DETS samples.

Date Received 22-Nov-23

Date Started 22-Nov-23

Date Completed 06-Dec-23

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

Kirk Bridgewood
General Manager



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Summary of Chemical Analysis

Soil Samples

Our Ref 23-27489

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	2266116	2266117
Sample ID	WP03-BH07	WP03-BH07
Depth	2.00	4.00
Other ID	3	5
Sample Type	ES	ES
Sampling Date	10/11/2023	10/11/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Preparation					
Moisture Content	DETSC 1004	0.1	%	24	7.1
Metals					
Antimony	DETSC 2301*	1	mg/kg	1.2	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	19	19
Barium	DETSC 2301#	1.5	mg/kg	99	44
Beryllium	DETSC 2301#	0.2	mg/kg	0.8	0.3
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.6	0.4
Cadmium	DETSC 2301#	0.1	mg/kg	1.4	0.2
Chromium	DETSC 2301#	0.15	mg/kg	19	22
Chromium III	DETSC 2301*	0.15	mg/kg	19	22
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	24	18
Lead	DETSC 2301#	0.3	mg/kg	51	18
Mercury	DETSC 2325#	0.05	mg/kg	0.08	< 0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	1.4	0.4
Nickel	DETSC 2301#	1	mg/kg	24	19
Selenium	DETSC 2301#	0.5	mg/kg	0.7	< 0.5
Zinc	DETSC 2301#	1	mg/kg	110	56
Inorganics					
pH	DETSC 2008#		pH	7.9	11.1
Acid / Alkali Reserve	DETSC 2011*	1	Oh/100g	< 1.0	< 1.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.2	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	1.9	0.7
Organic matter	DETSC 2002#	0.1	%	3.0	1.6
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.8	12
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076*	10	%	< 10	< 10
Petroleum Hydrocarbons					
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9

Summary of Chemical Analysis

Soil Samples

Our Ref 23-27489

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	2266116	2266117
Sample ID	WP03-BH07	WP03-BH07
Depth	2.00	4.00
Other ID	3	5
Sample Type	ES	ES
Sampling Date	10/11/2023	10/11/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	< 10
EPH (C10-C40): EH_1D_Total	DETSC 3311#	10	mg/kg	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
MTBE	DETSC 3321	0.01	mg/kg	< 0.01	< 0.01
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

Summary of Chemical Analysis

Leachate Samples

Our Ref 23-27489

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	2266118	2266119
Sample ID	WP03-BH07	WP03-BH07
Depth	2.00	4.00
Other ID	3	5
Sample Type	ES	ES
Sampling Date	10/11/2023	10/11/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Preparation					
NRA Leachate Preparation	DETSC 1009*			Y	Y
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	2.2	1.3
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	10	7.7
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.2	0.8
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.84	0.19
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.7	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	1.5
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	1.3	0.9
Zinc, Dissolved	DETSC 2306	1.3	ug/l	1.4	< 1.3
Inorganics					
pH	DETSC 2008		pH	7.8	7.6
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Dissolved Organic Carbon	DETSC 2085	2	mg/l	2.7	< 2.0
Total Hardness as CaCO3	DETSC 2303	0.1	mg/l	28.0	20.9
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.063	< 0.015
Chloride	DETSC 2055	0.1	mg/l	1.8	0.62
Sulphate as SO4	DETSC 2055	0.1	mg/l	4.5	6.5
Sulphide	DETSC 2208	10	ug/l	< 10	18
Petroleum Hydrocarbons					
Aliphatic C5-C6: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10: HS_1D_AL	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	ug/l	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10: HS_1D_AR	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0

Summary of Chemical Analysis

Leachate Samples

Our Ref 23-27489

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	2266118	2266119
Sample ID	WP03-BH07	WP03-BH07
Depth	2.00	4.00
Other ID	3	5
Sample Type	ES	ES
Sampling Date	10/11/2023	10/11/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	ug/l	< 10	< 10
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0
MTBE	DETSC 3322	1	ug/l	< 1.0	< 1.0
PAHs					
Naphthalene	DETSC 3304	0.05	ug/l	0.21	0.09
Acenaphthylene	DETSC 3304	0.01	ug/l	0.07	0.04
Acenaphthene	DETSC 3304	0.01	ug/l	0.23	0.03
Fluorene	DETSC 3304	0.01	ug/l	0.10	0.02
Phenanthrene	DETSC 3304	0.01	ug/l	0.13	0.07
Anthracene	DETSC 3304	0.01	ug/l	0.05	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.24	0.13
Pyrene	DETSC 3304	0.01	ug/l	0.19	0.12
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	0.10	0.07
Chrysene	DETSC 3304	0.01	ug/l	0.12	0.08
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.13	0.10
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.05	0.04
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.10	0.08
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	0.11	0.09
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.02	0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.10	0.09
PAH Total	DETSC 3304	0.2	ug/l	2.0	1.1
Phenols					
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100

Summary of Asbestos Analysis Soil Samples

Our Ref 23-27489

Client Ref 23-0343

Contract Title RWE Dublin Array GPR Survey

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2266116	WP03-BH07 3 2.00	SOIL	NAD	none	Josh Best
2266117	WP03-BH07 5 4.00	SOIL	NAD	none	Josh Best

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-27489
 Client Ref 23-0343
 Contract RWE Dublin Array GPR Survey

Containers Received & Deviating Samples

					Inappropriate container for tests
Lab No	Sample ID	Date	Containers Received	Holding time exceeded for tests	tests
		Sampled			
2266116	WP03-BH07 2.00 SOIL	10/11/23	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
2266117	WP03-BH07 4.00 SOIL	10/11/23	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	
2266118	WP03-BH07 2.00 LEACHATE	10/11/23	GJ 250ml, GJ 60ml, PT 1L		
2266119	WP03-BH07 4.00 LEACHATE	10/11/23	GJ 250ml, GJ 60ml, PT 1L		

Key: G-Glass P-Plastic J-Jar 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

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C35-C40	EH_CU_1D_AL
Aliphatic C5-C40	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C35-C40	EH_CU_1D_AR
Aromatic C5-C40	EH_CU+HS_1D_AR
TPH Ali/Aro C5-C40	EH_CU+HS_1D_Total
EPH (C10-C40)	EH_1D_Total

End of Report



CAUSEWAY
— GEOTECH

APPENDIX H
SPT HAMMER ENERGY MEASUREMENT REPORT



SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Southern Testing
Unit 11
Charlwoods Road
East Grinstead
West Sussex
RH19 2HU

SPT Hammer Ref: 1411.
Test Date: 18/02/2023
Report Date: 20/02/2023
File Name: 1411..spt
Test Operator: RWS

Instrumented Rod Data

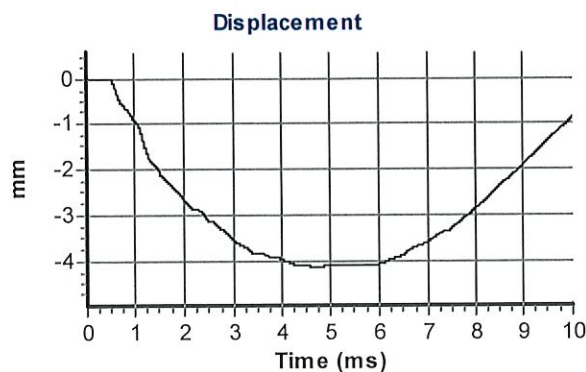
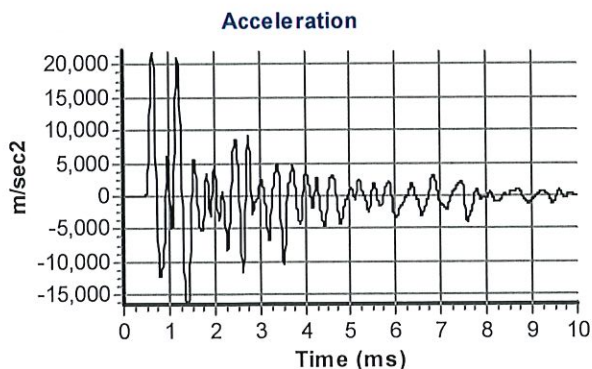
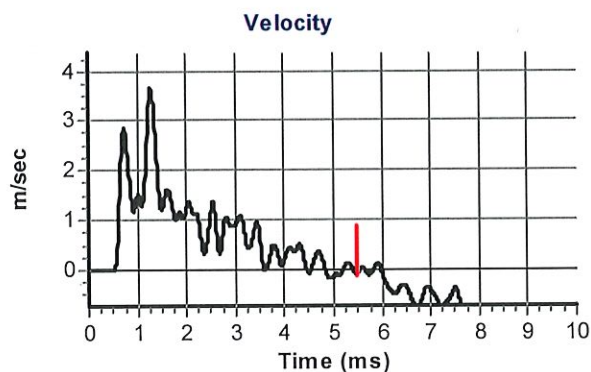
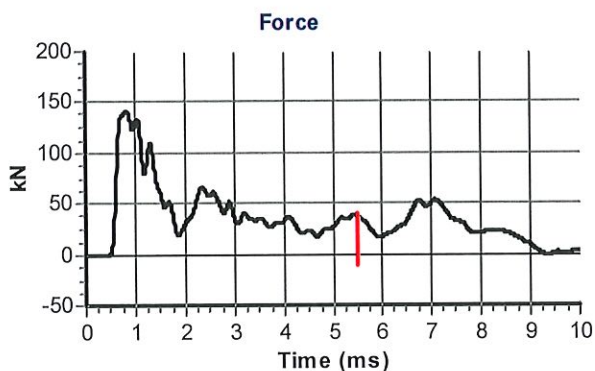
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.7
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 64786
Accelerometer No.2: 64789

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location

CAUSEWAY



Calculations

Area of Rod A (mm^2): 996
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 303

Energy Ratio E_r (%): 64

Signed: Bob Stewart

Title: Technician

The recommended calibration interval is 12 months

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Southern Testing
Unit 11
Charlwoods Road
East Grinstead
West Sussex
RH19 2HU

SPT Hammer Ref: 0208.
Test Date: 18/02/2023
Report Date: 20/02/2023
File Name: 0208..spt
Test Operator: RWS

Instrumented Rod Data

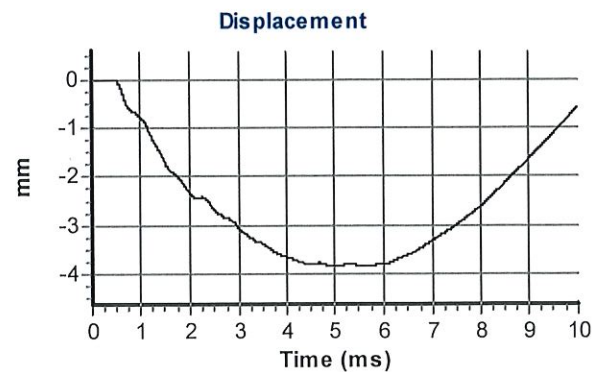
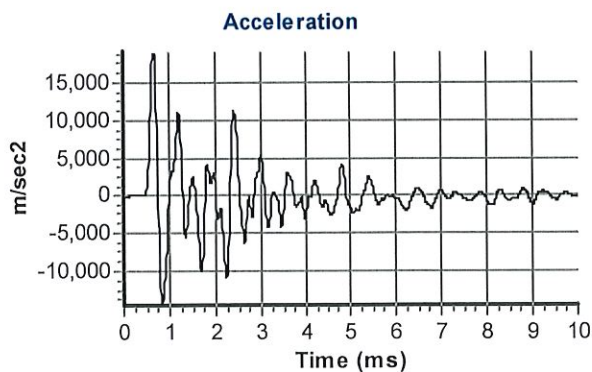
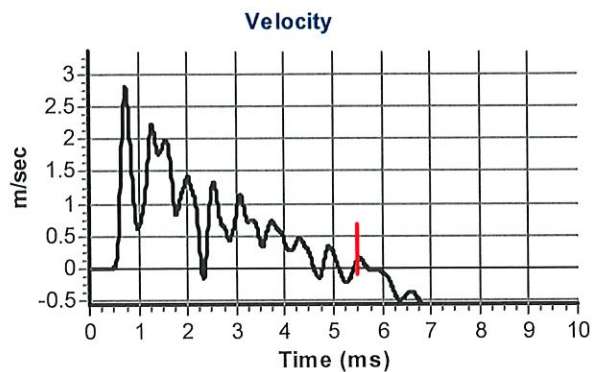
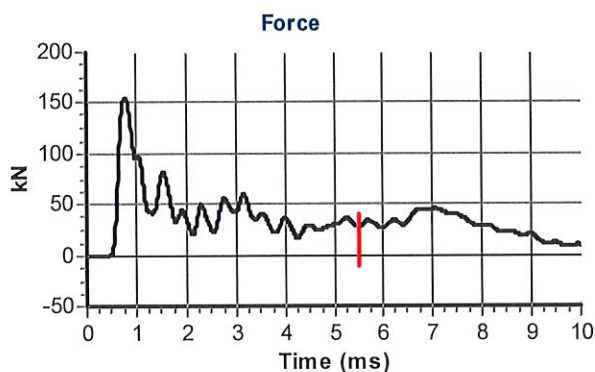
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.7
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 64786
Accelerometer No.2: 64789

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location

CAUSEWAY



Calculations

Area of Rod A (mm^2): 996
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 244

Energy Ratio E_r (%):

52

Signed: Bob Stewart

Title: Technician

The recommended calibration interval is 12 months



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