

Limerick WWTP Upgrade and Regional Bioresource Centre

Appendix 14.2 - SI Factual Report Corcanree PS

June 2026



Formerly JB Barry Partners who became part of Egis in 2023



Limerick WWTP Upgrade Projects Corcanree Pumping Station (PS) Site Investigation – Factual Report

Report No: 2099-21B

19th January 2022

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

Uisce Eireann

J.B. Barry & Partners Ltd



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CONTENTS

1	INTRODUCTION	1
2	SITE AND GEOLOGY	1
2.1	The Site	
2.2	Published Geology	
3	FIELDWORK	2
3.1	General	
3.2	Exploratory Holes	
3.3	In-situ Testing	
3.4	Instrumentation and Monitoring	
3.5	Topographical Survey	
4	LABORATORY TESTING	4
4.1	Geotechnical Testing	
	REFERENCES	5
	APPENDICES	
A	DRAWINGS	
B	EXPLORATORY HOLE RECORDS	
C	IN-SITU TESTING RESULTS	
D	LABORATORY TESTING RESULTS	
E	PHOTOGRAPHS	

1 INTRODUCTION

During May 2021 Whiteford Geoservices Ltd was commissioned by Uisce Eireann (Irish Water) and J.B. Barry & Partners Ltd (Consulting Engineers) to undertake site investigation works at Corcanree Pumping Station (PS) as part of the Limerick WWTP Upgrade Projects contract.

The investigation was required to obtain geotechnical information at the Corcanree Pumping Station site; primarily to establish the existing ground conditions at the proposed location of new tanks and other associated infrastructure.

The investigation was performed in accordance with the relevant standards (see References) and the fieldwork was carried out between 24th May and 6th September 2021.

This report presents the factual records of the site investigations undertaken.

2 SITE AND GEOLOGY

2.1 The Site

Corcanree Pumping Station (PS) is situated approximately 300m northerly adjacent to R510 Dock Road, 2.75km south-west of Limerick city, Co. Limerick. The site lies approximately 60m south of the River Shannon.

Site investigation works were undertaken within both the existing pumping station facility and adjacent lands owned by Shannon Foynes Port Authority, situated between the pumping station site and the River Shannon.

2.2 Published Geology

The published geological maps indicate that Visean Limestone is the predominant solid geology in the local region.

Superficial geology consisting predominantly of estuarine silts and clays were anticipated to be present, with underlying granular soils (gravel) also likely to be encountered.

Due to the nature of the investigation site a layer of made ground / fill, of unknown thickness, was anticipated to be present.

3 FIELDWORK

3.1 General

The fieldwork was carried out in general accordance with BS 5930:2015+A1:2020, BS EN 1997-2 (2007) and BS EN ISO 22475-1 (2006) and other related standards.

Refer to Appendix A for the drawing ‘*Limerick WWTP Upgrade Projects – Corcanree Pumping Station – Site Investigation – Site Investigation Layout Plan 2099-21B-SI-L1 Rev 01*’ indicating the positions of all site investigations undertaken by Whiteford Geoservices Ltd. Site investigations were surveyed to Irish Transverse Mercator (ITM) and Malin Head (Ordnance Datum).

3.2 Exploratory Holes

The exploratory holes are detailed within the following table.

METHOD	QUANTITY	MAXIMUM DEPTH (m)	EQUIPMENT
Trial Holes	2 Nr.	4.50m (TP-02CR)	Trial Holes carried out using a Doosan DX140 tracked excavator.
Percussive Boreholes	6 Nr.	10.00m (BH06CR)	Percussive boreholes sunk using a Dando 2000 percussive drilling rig.
Rotary Cored Boreholes	4 Nr.	55.00m (RC01CR)	Rotary boreholes carried out using a Beretta T44 Rotary Coring rig.

The engineering logs contained within Appendix B provide descriptions of the strata encountered, together with observations made during excavation, coring and drilling works.

3.3 In-situ Testing

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

TYPE	QUANTITY	MAXIMUM DEPTH (m)	REMARKS
Standard Penetration Test (SPT)	38 Nr.	9.50m (BH06CR)	SPTs carried out using a Dando 2000 percussive rig.
Packer Test	5 Nr.	17.00m (RC01CR)	Accordance with BS5930.
Hand Penetrometer Test	1 Nr.	3.00m (TP-02CR)	Undertaken using a hand-held pocket penetrometer.

3.4 Instrumentation and Monitoring

The following table details the monitoring instrumentation installed within the exploratory holes upon completion.

LOCATION	ITM COORDINATES (EASTING / NORTHING / ELEVATION)	MONITORING SECTION (M) B.G.L.	TOP SEAL (M) B.G.L.	END DEPTH (M) B.G.L.
BH/RC01CR	E: 555463.40 N: 656236.16 Z: 4.50	15.00 – 25.00	0.00 – 15.00	25.00
BH/RC04CR	E: 555426.68 N: 656257.30 Z: 4.90	8.00 – 16.00	0.00 – 8.00	16.00
BH05CR	E: 555400.70 N: 656252.32 Z: 4.75	0.00 – 6.00	-	6.00

LOCATION	MONITORING DATE	WATER LEVEL (M) B.G.L.	WATER LEVEL (M) AOD
BH/RC01CR	09-09-2021	6.50	- 2.00
BH/RC04CR	09-09-2021	6.10	- 1.20
BH05CR	09-09-2021	5.60	- 0.85

3.5 Topographical Survey

The topographical survey of each individual site investigation location was undertaken post-completion of all associated works and is detailed in the following table.

EQUIPMENT	LOCATION	COORDINATE SYSTEM
Leica RTK / GNSS DGPS System	Refer to Appendix A <i>2099-21B-SI-L1 Rev 01</i>	Irish Transverse Mercator (ITM) / Malin Head (Ordnance Datum)

4 LABORATORY TESTING

4.1 Geotechnical Testing

The testing was scheduled by J.B. Barry & Partners Ltd and carried out in accordance with BS 1377 (1990) and ISRM (2007) by Whiteford Geoservices Ltd.

The testing is summarised in the table below and the results are presented within Appendix D.

TYPE	QUANTITY	REMARKS
Natural Moisture Content	28 Nr.	BS 1377- Part 2 (1990) : Section 2
Atterberg Limits	18 Nr.	BS 1377- Part 2 (1990) : Section 2
Particle Size Distribution (PSD)	18 Nr.	BS 1377- Part 2 (1990) : Sections 3 & 9
PSD Sedimentation	6 Nr.	BS 1377- Part 2 (1990) : Sections 3 & 9
Total Sulphate as SO ₄ BRE	9 Nr.	BS 1377- Part 2 (1990)
pH	9 Nr.	BS 1377- Part 2 (1990)
Organic Matter	6 Nr.	BS 1377- Part 2 (1990)
Oedometer 1D Consolidation	2 Nr.	BS 1377- Part 2 (1990) : Sections 7 & 8
Point Load	16 Nr.	ASTM D5731-08
Uniaxial Compressive Strength (UCS)	14 Nr.	ASTM D5731-08
Porosity / Density	2 Nr.	ISRM Part 1 : 3 : Page 88
Slake Durability Index	2 Nr.	ISRM Part 2.2
Los Angeles Abrasion Value	1 Nr.	BS EN 1097-2 : 2010

REFERENCES

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

BS 5930:2015+A1:2020 : Code of practice for site investigations (Amendment 2). British Standards Institution.

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

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

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

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

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

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

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

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

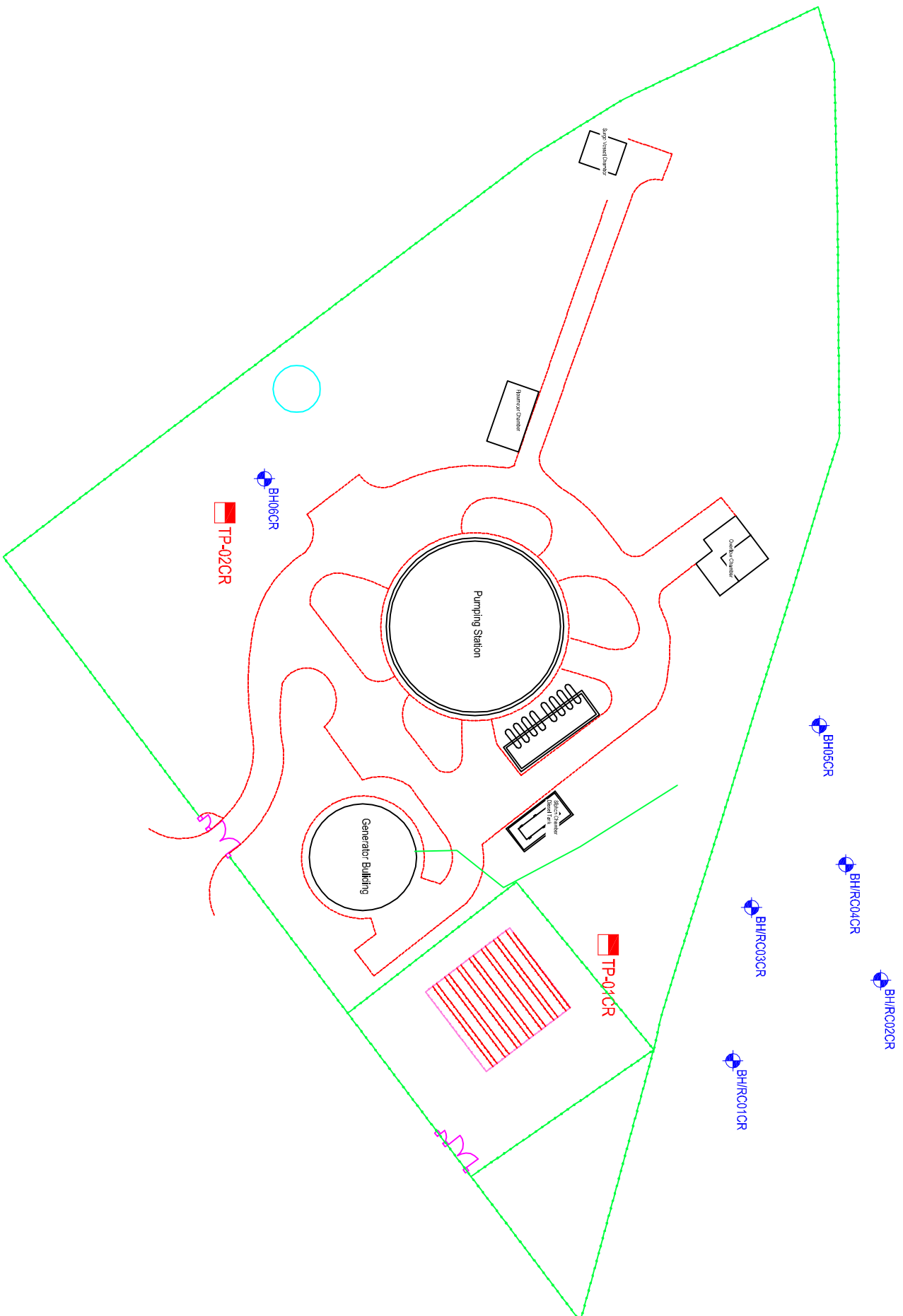
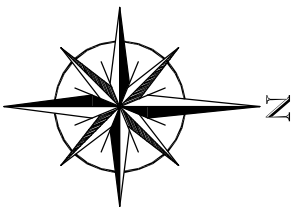
ASTM C215-08: Standard Test Method for Fundamental Transverse, Longitudinal, and Torsional Frequencies of Concrete Specimens

PAS 128: 2014 Specification for underground utility detection, verification and location.

APPENDIX A

DRAWINGS

LIMERICK WWTP UPGRADE PROJECTS – CORCANREE PUMPING STATION 1 x A3
SITE INVESTIGATION
SITE INVESTIGATION LAYOUT PLAN
2099-21B-SI-L1 Rev 01



Investigation Drawing Key:

TP-01CR TRIAL HOLE LOCATION

BH/RC01CR
BOREHOLE / ROTARY CORE LOCATION

Client	USCSE EIREANN		
Project	LIMERICK WWTP UPGRADE PROJECTS - CORCANREE PUMPING STATION		
Stage	SITE INVESTIGATION		
Title	SITE INVESTIGATION LAYOUT PLAN		
Scales	1 : 1,000 @ A3		
Surveyed RH / AT	Drawn RC	Checked WGS	Date Sept 2021

WHITEFORD GEOSERVICES LTD
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CO. ANTRIM
BT39 9NE
UNITED KINGDOM
+44 (0)28 9334 9351

Drawing No. 2099-21B-SI-L1	Revision - Draft					
	01					

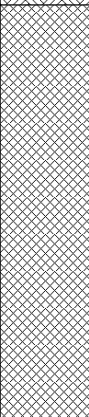
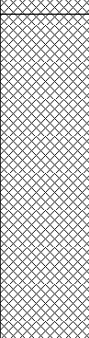
APPENDIX B

EXPLORATORY HOLE RECORDS

TRIAL HOLES	2 x A4
PERCUSSIVE BOREHOLES	6 x A4
ROTARY CORED BOREHOLES	18 x A4

Trial Pit Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 11/06/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555441.68 N656212.90	
Project No. : 2099-21		Crew Name:		Equipment: Doosan DX140	
Location Number TP-01CR	Location Type TP	Level 4.40m AoD	Logged By AT	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	4.30		TOPSOIL.	1
								Loose to medium dense, brownish grey, clayey, gravelly sand with many cobbles and boulders. [MADE GROUND]	
		1.00	B		1.50	2.90		Soft, dark grey, sandy, gravelly clay with many cobbles. [MADE GROUND]	2
		2.00	B		1.80	2.60		Soft, pinkish brown, sandy, gravelly clay with many cobbles and some boulders. [MADE GROUND] Construction waste / rubble present.	
		3.00	B		2.90	1.50		Very soft to soft, yellowish grey, slightly sandy, slightly gravelly SILT with some sub-angular to sub-rounded cobbles.	3
		4.00	B		3.80	0.60		Very soft, yellowish grey, slightly sandy, slightly gravelly SILT with many sub-angular to sub-rounded cobbles and occasional boulders.	4
					4.20	0.20		End of Borehole at 4.200m	5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
5.50	1.10	Excavation instability at 2.50m b.g.l.					

Remarks Weak flow of groundwater at 3.70m b.g.l. PP = In-situ Pocket Penetrometer test (Results in kPa) End of Trial Hole at 4.20m b.g.l.							
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Trial Pit Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 11/06/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555360.85 N656141.20	
Project No. : 2099-21		Crew Name:		Equipment: Doosan DX140	
Location Number TP-02CR	Location Type TP	Level 4.10m AoD	Logged By AT	Scale 1:25	Page Number Sheet 1 of 1

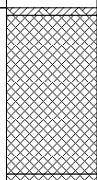
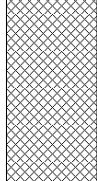
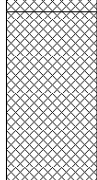
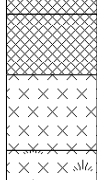
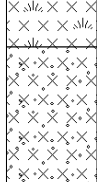
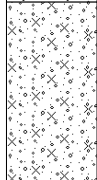
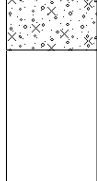
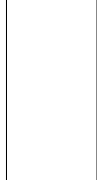
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		1.00	B		0.20	3.90		TOPSOIL.	1
								Firm, pinkish grey, sandy, gravelly clay with many cobbles and boulders. [MADE GROUND]	
					0.80	3.30		Loose to medium dense, pinkish grey, clayey, sandy gravel with many cobbles and some boulders. [MADE GROUND] Construction waste / rubble present.	
		2.00	B		1.80	2.30		Very soft to soft, grey, slightly sandy SILT.	2
		3.00 3.00	B PP	75.00					3
		4.00	B						4
			4.50	-0.40			End of Borehole at 4.500m	5	

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
5.50	1.10	Excavation stable.					

Remarks No groundwater observed. PP = In-situ Pocket Penetrometer test (Results in kPa) End of Trial Hole at 4.50m b.g.l.						
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Percussion Drilling Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 01/06/2021 - 02/06/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555463.40 N656236.16	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Dando 2000	
Borehole Number BH01CR	Hole Type CP	Level 4.50m AoD	Logged By RC	Scale 1:50	Page Number Sheet 1 of 1

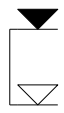
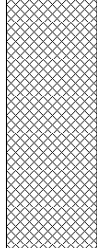
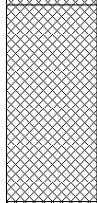
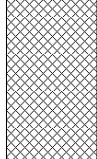
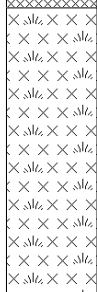
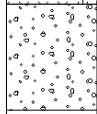
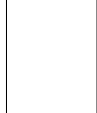
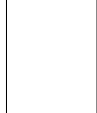
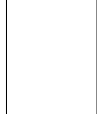
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.05	4.45		TOPSOIL. Firm, brown, slightly sandy, gravelly clay with many cobbles and some boulders. [MADE GROUND] Concrete and plastic fragments present.	1
		1.00 1.20	B SPT	N=50 (22,19/50 for 235mm)	1.10	3.40		Very stiff, light greyish brown, sandy, gravelly clay with many cobbles. [MADE GROUND]	2
		2.00 2.00	B SPT	N=23 (15,10/6,7,6,4)	2.40	2.10		Stiff to very stiff, light greyish brown, sandy, gravelly clay with many cobbles. [MADE GROUND]	3
		3.00 3.00	B SPT	N=10 (1,1/0,0,2,8)	3.60	0.90		Stiff, dark grey, slightly sandy, slightly gravelly clay. [MADE GROUND]	4
		4.00 4.00	B SPT	N=2 (0,0/0,0,1,1)	4.00	0.50		Very soft, dark grey SILT.	5
		4.50	U		4.50	0.00		Very soft, light grey, organic SILT.	6
		5.00 5.00	B SPT	N=2 (0,0/1,0,0,1)	5.00	-0.50		Very soft to soft, dark grey, slightly gravelly SILT.	7
		6.00 6.00	B SPT	N=50 (2,0/50 for 230mm)	5.90	-1.40		Dense, light grey, silty, sandy GRAVEL with some cobbles.	8
		7.00	B		7.40	-2.90		End of Borehole at 7.400m	9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
7.40	200	7.40	200	6.50 7.20	6.80 7.40	00:30 01:00		0.00	7.40	90	0

Remarks Groundwater encountered at 5.80m b.g.l. (5.60m after 20 mins) End of Borehole at 7.40m b.g.l. - unable to advance casing / tooling further.										
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Percussion Drilling Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 28/05/2021 - 31/05/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555448.30 N656263.80	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Dando 2000	
Borehole Number BH02CR	Hole Type CP	Level 5.00m AoD	Logged By RC	Scale 1:50	Page Number Sheet 1 of 1

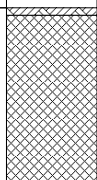
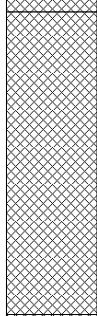
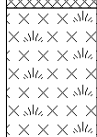
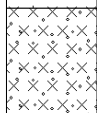
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.50	4.50		Soft, brown, gravelly clay with many cobbles and boulders. [MADE GROUND]	
					0.80	4.20		804 Gravel. [MADE GROUND]	
		1.00 1.20	B SPT	50 (25,30/50 for 155mm)				Stiff, brownish grey, gravelly clay with many cobbles and some boulders. [MADE GROUND]	1
		2.00 2.00	B SPT	N=22 (30,19/7,5,5,5)				Very stiff, light brown, slightly gravelly clay with many cobbles and some boulders. [MADE GROUND]	2
		3.00 3.00	B SPT	N=26 (6,3/6,5,8,7)				Very stiff, dark brownish grey, slightly sandy, gravelly clay with many cobbles. [MADE GROUND]	3
		4.00 4.00	B SPT	N=45 (3,2/2,3,10,30)				Soft, light grey, slightly organic SILT.	4
		5.00 5.00	B SPT	N=5 (0,1/1,1,2,1)					5
		6.00	B						6
		6.50	SPT	N=55 (4,3/5,15,14,21)					7
		7.00	B						8
					7.50	-2.50		End of Borehole at 7.500m	9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
7.50	200	7.50	200	1.20 4.40 6.50 7.50	1.90 4.80 6.80 7.50	00:30 00:30 01:00 01:00		0.00	7.50	90	0

Remarks Groundwater encountered at 6.50m b.g.l. (6.00m after 20 mins) End of Borehole at 7.50m b.g.l. - unable to advance casing / tooling further.										
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Percussion Drilling Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 02/06/2021 - 03/06/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555434.72 N656239.66	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Dando 2000	
Borehole Number BH03CR	Hole Type CP	Level 4.60m AoD	Logged By RC	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.05	4.55		TOPSOIL. Firm, light brown, slightly sandy, gravelly clay with many cobbles and occasional boulders. [MADE GROUND] Plastic fragments present.	1
		1.00	B						
		1.20	SPT	N=50 (4,10/50 for 235mm)	1.20	3.40		Dense, light grey gravel with cobbles and occasional boulders. [MADE GROUND]	
					1.80	2.80		Stiff to very stiff, light greyish brown, sandy, gravelly clay with many cobbles. [MADE GROUND]	2
		2.00	B						
		2.00	SPT	N=43 (5,5/7,8,14,14)					
		3.00	B						3
		3.00	SPT	N=7 (1,3/2,2,1,2)					
		3.50	U						
		4.00	B		3.80	0.80		Firm to stiff, light grey, slightly sandy, slightly gravelly clay. [MADE GROUND]	4
		4.00	SPT	N=8 (2,4/2,2,2,2)					
		4.50	U		4.30	0.30		Soft, dark grey, organic SILT with occasional cobbles.	
		5.00	B						5
		5.00	SPT	N=8 (0,3/4,2,1,1)	5.20	-0.60		Firm, light grey, slightly gravelly SILT.	
		6.00	B		5.90	-1.30		Dense, light grey GRAVEL with many cobbles and occasional boulders.	6
		6.50	SPT	50 (50,50/50 for 5mm)	6.50	-1.90		Gravel is fine to coarse and angular. End of Borehole at 6.500m	7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
6.50	200	6.50	200	6.00 6.50	6.30 6.50	01:00 01:00		0.00	6.50	90	0

Remarks Groundwater encountered at 3.50m b.g.l. (3.20m after 20 mins) / Groundwater encountered at 5.70m b.g.l. End of Borehole at 6.50m b.g.l. - unable to advance casing / tooling further.										
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Percussion Drilling Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 26/05/2021 - 27/05/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555426.68 N656257.30	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Dando 2000	
Borehole Number BH04CR	Hole Type CP	Level 4.90m AoD	Logged By RC	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.03	4.87		TOPSOIL.	
					0.05	4.85		804 Gravel. [MADE GROUND]	
		0.50	B		0.30	4.60		Soft, greyish brown, gravelly clay with cobbles and boulders. [MADE GROUND]	
								Firm to stiff, dark grey, gravelly clay with some cobbles and boulders. [MADE GROUND]	1
		1.20	SPT	N=26 (2,2/4,14,6,2)					
		1.50	B						
		2.00	SPT	50 (1,1/50 for 125mm)					2
		2.50	B						
		3.00	SPT	N=12 (5,4/7,2,2,1)					
		3.50	B						
		4.00	SPT	N=7 (1,1/1,2,2,2)	4.10	0.80		Loose, dark grey, silty GRAVEL.	4
		4.50	B					Gravel is fine to coarse and angular.	
		5.00	SPT	N=0 (0,0/0,0,0,0)	5.00	-0.10		Very soft, grey SILT.	5
		5.50	B						
		6.50	B		6.20	-1.30		Soft, pinkish grey, gravelly SILT with some cobbles.	6
		6.50	SPT	N=31 (5,4/8,11,7,5)	6.50	-1.60		Medium dense to dense, light grey GRAVEL with some cobbles.	
		7.00	B					Gravel is fine to coarse and angular.	7
					7.30	-2.40		End of Borehole at 7.300m	
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
7.30	200	7.30	200	2.00 6.90	2.50 7.30	00:30 01:00		0.00	7.30	90	0

Remarks Groundwater encountered at 4.10m b.g.l. (3.00m after 20 mins) / Groundwater encountered at 6.30m b.g.l. (6.00m after 20 mins) End of Borehole at 7.30m b.g.l. - unable to advance casing / tooling further.										
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Percussion Drilling Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 25/05/2021 - 26/05/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555400.70 N656252.32	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Dando 2000	
Borehole Number BH05CR	Hole Type CP	Level 4.75m AoD	Logged By RC	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20 0.30	4.55 4.45		TOPSOIL. 804 Gravel / Brown clay. [MADE GROUND] Firm to stiff, brown, gravelly clay with many cobbles and boulders. [MADE GROUND]	
		1.00 1.20	B SPT	50 (30,38/50 for 95mm)					1
		2.00 2.00	B SPT	50 (20,25/50 for 180mm)					2
		3.00 3.00	B SPT	N=38 (6,4/2,1,0,35)					3
		4.00 4.00	B SPT	50 (50,50/50 for 5mm)					4
		5.00 5.00	B SPT	N=16 (3,1/1,1,4,10)	4.90	-0.15		Stiff, brown, silty, gravelly CLAY with occasional cobbles.	5
		5.80 6.00	B SPT	50 (8,26/50 for 85mm)	5.80 6.00	-1.05 -1.25		Medium dense, blueish grey, sandy GRAVEL. End of Borehole at 6.000m	6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
6.00	200	6.00	200	1.20 2.00 3.50 4.00 5.80	1.90 2.40 4.00 4.60 6.00	00:30 00:30 00:30 01:00 01:00		0.00	6.00	90	0

Remarks Groundwater encountered at 4.10m b.g.l. (4.00m after 20 mins) End of Borehole at 6.00m b.g.l. - unable to advance casing / tooling further. Standpipe Installation - 60mm Slotted Pipe 0.00m - 6.00m b.g.l.										
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Percussion Drilling Log

Project Name: Limerick WWTP Upgrade
Projects - Site Investigation

Client: Uisce Eireann

Date: 24/05/2021 - 25/05/2021

Location: Limerick, Co. Limerick

Contractor: Whiteford Geoservices Ltd

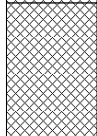
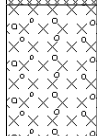
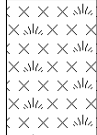
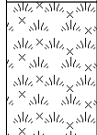
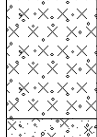
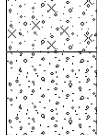
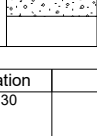
Co-ords: E555354.50 N656148.58

Project No. : 2099-21

Crew Name: GII

Drilling Equipment: Dando 2000

Borehole Number BH06CR	Hole Type CP	Level 4.12m AoD	Logged By RC	Scale 1:50	Page Number Sheet 1 of 1
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Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20	3.92		TOPSOIL.	1
		0.50	B					Firm, brown, gravelly clay with cobbles and boulders. [MADE GROUND] Concrete and plastic fragments present.	
		1.20	SPT	N=18 (2,4/5,5,4,4)	1.00	3.12		Stiff, greyish brown, slightly silty, gravelly clay with some cobbles and occasional boulders. [MADE GROUND]	2
		1.50	B						
		2.00	SPT	50 (34,41/50 for 80mm)				Very soft, light grey SILT with occasional cobbles.	3
		2.50	B		2.50	1.62			
		3.00	SPT	N=1 (0,1/0,0,1,0)				Very soft, light grey, organic peaty SILT.	4
		3.50	B		3.80	0.32			
		4.00	SPT	N=1 (0,0/1,0,0,0)				Very soft, dark brown, silty PEAT.	6
		4.50	B						
		5.00	SPT	N=3 (1,1/1,0,1,1)				Soft, light pinkish grey, gravelly SILT.	7
		5.50	B						
		6.50	B					Gravel is medium to coarse and angular.	8
		6.50	SPT	N=2 (0,0/1,0,0,1)	7.00	-2.88			
		7.50	B					Very loose, light pinkish grey, silty, sandy GRAVEL with some cobbles.	9
		8.00	SPT	N=3 (0,1/0,0,1,2)	8.00	-3.88			
		8.50	B					Medium dense to dense, blueish grey, silty SAND and GRAVEL with some cobbles and occasional boulders.	10
		9.50	B		8.90	-4.78			
		9.50	SPT	N=43 (3,3/7,7,12,17)				Gravel is fine to coarse and angular. Sand is coarse grained.	
		10.00			10.00	-5.88		End of Borehole at 10.000m	

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
10.00	200	10.00	200	2.00	2.50	00:30		0.00	10.00	90	0

Remarks

Groundwater encountered at 7.40m b.g.l. (7.30m after 20 mins)

End of Borehole at 10.00m b.g.l. - designated depth achieved.



Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation			Client: Uisce Eireann			Date: 23/08/2021 - 26/08/2021		
Location: Limerick, Co. Limerick			Contractor: Whiteford Geoservices Ltd			Co-ords: E555463.40 N656236.16		
Project No. : 2099-21			Crew Name: GII			Drilling Equipment: Beretta T44		
Borehole Number RC01CR		Hole Type CP+RC		Level 4.50m AoD		Logged By RC		Page Number Sheet 1 of 6

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
								0.05	4.45		TOPSOIL. Firm, brown, slightly sandy, gravelly clay with many cobbles and some boulders. [MADE GROUND]	
								1.10	3.40		Very stiff, light greyish brown, sandy, gravelly clay with many cobbles. [MADE GROUND]	1
								2.40	2.10		Stiff to very stiff, light greyish brown, sandy, gravelly clay with many cobbles. [MADE GROUND]	2
								3.60	0.90		Stiff, dark grey, slightly sandy, slightly gravelly clay. [MADE GROUND]	3
								4.00	0.50		Very soft, dark grey SILT.	4
								4.50	0.00		Very soft, light grey, organic SILT.	
								5.00	-0.50		Very soft to soft, dark grey, slightly gravelly SILT.	5
								5.90	-1.40		Dense, light grey, silty, sandy GRAVEL with some cobbles.	6
								7.40	-2.90		Medium strong to strong, grey, fine grained, crystalline, partially weathered to unweathered, medium fractured LIMESTONE.	7
		7.40 - 8.50	4	100	83	83						8
		8.50 - 10.10	2	100	98	98						9
			Type/FI	TCR	SCR	RQD	D/R(SPT)					10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	55.00	90	0						

Remarks

Standpipe Installation: 0.00m - 15.00m b.g.l. (50mm Plain) / 15.00m - 25.00m b.g.l. (50mm Slotted)

End of Rotary Cored Borehole at 55.00m b.g.l.



Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation			Client: Uisce Eireann			Date: 23/08/2021 - 26/08/2021		
Location: Limerick, Co. Limerick			Contractor: Whiteford Geoservices Ltd			Co-ords: E555463.40 N656236.16		
Project No. : 2099-21			Crew Name: GII			Drilling Equipment: Beretta T44		
Borehole Number RC01CR		Hole Type CP+RC		Level 4.50m AoD		Logged By RC		Page Number Sheet 2 of 6

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		10.10 - 11.60	3	100	97	94					Medium strong to strong, grey, fine grained, crystalline, partially weathered to unweathered, medium fractured LIMESTONE.	11
		11.60 - 12.90	4	90	88	86						12
		12.90 - 14.40	4	100	92	86						13
		14.40 - 16.00	3	100	100	95						14
		16.00 - 17.40	2	100	100	100		16.00	-11.50		Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	15
		17.40 - 18.90	4	100	98	92						16
		18.90 - 20.40	2	100	100	100						17
												18
												19
												20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	55.00	90	0						

Remarks Standpipe Installation: 0.00m - 15.00m b.g.l. (50mm Plain) / 15.00m - 25.00m b.g.l. (50mm Slotted) End of Rotary Cored Borehole at 55.00m b.g.l.																	
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Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation			Client: Uisce Eireann			Date: 23/08/2021 - 26/08/2021		
Location: Limerick, Co. Limerick			Contractor: Whiteford Geoservices Ltd			Co-ords: E555463.40 N656236.16		
Project No. : 2099-21			Crew Name: GII			Drilling Equipment: Beretta T44		
Borehole Number RC01CR		Hole Type CP+RC		Level 4.50m AoD		Logged By RC		Page Number Sheet 3 of 6

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		20.40 - 22.00	2	100	95	95					Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	21
		22.00 - 23.50	3	100	100	94						22
		23.50 - 25.00	4	100	100	90						23
		25.00 - 26.50	3	100	100	97						24
		26.50 - 28.00	3	100	97	92						25
		28.00 - 29.50	3	100	100	100						26
												27
												28
												29
												30

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	55.00	90	0						

Remarks Standpipe Installation: 0.00m - 15.00m b.g.l. (50mm Plain) / 15.00m - 25.00m b.g.l. (50mm Slotted) End of Rotary Cored Borehole at 55.00m b.g.l.																	
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Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 23/08/2021 - 26/08/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555463.40 N656236.16	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Beretta T44	
Borehole Number RC01CR	Hole Type CP+RC	Level 4.50m AoD	Logged By RC	Scale 1:50	Page Number Sheet 4 of 6

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		29.50 - 31.00	3	100	100	98					Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	
		31.00 - 32.40	2	100	100	100						31
		32.40 - 34.00	3	100	100	100						32
		34.00 - 35.50	3	95	93	90						33
		35.50 - 37.00	2	100	100	98						34
		37.00 - 38.50	4	100	100	97						35
		38.50 - 40.00	2	100	100	100						36
												37
												38
												39
						40						

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	55.00	90	0						

Remarks

Standpipe Installation: 0.00m - 15.00m b.g.l. (50mm Plain) / 15.00m - 25.00m b.g.l. (50mm Slotted)

End of Rotary Cored Borehole at 55.00m b.g.l.



Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation			Client: Uisce Eireann			Date: 23/08/2021 - 26/08/2021		
Location: Limerick, Co. Limerick			Contractor: Whiteford Geoservices Ltd			Co-ords: E555463.40 N656236.16		
Project No. : 2099-21			Crew Name: GII			Drilling Equipment: Beretta T44		
Borehole Number RC01CR		Hole Type CP+RC		Level 4.50m AoD		Logged By RC		Page Number Sheet 5 of 6

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		40.00 - 41.50	1	100	100	100					Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	41
		41.50 - 43.00	2	100	100	95						42
		43.00 - 44.50	2	100	100	100						43
		44.50 - 46.00	5	100	92	85						44
		46.00 - 47.50	3	100	98	91						45
		47.50 - 49.00	3	100	97	97						46
		49.00 - 50.50	3	100	97	92						47
												48
												49
												50

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	55.00	90	0						

Remarks Standpipe Installation: 0.00m - 15.00m b.g.l. (50mm Plain) / 15.00m - 25.00m b.g.l. (50mm Slotted) End of Rotary Cored Borehole at 55.00m b.g.l.																	
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Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 23/08/2021 - 26/08/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555463.40 N656236.16	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Beretta T44	
Borehole Number RC01CR	Hole Type CP+RC	Level 4.50m AoD	Logged By RC	Scale 1:50	Page Number Sheet 6 of 6

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
								55.00	-50.50		Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	51
		50.50 - 52.00	2	100	100	100						52
		52.00 - 53.50	3	100	100	97						53
		53.50 - 55.00	2	100	92	90						54
												55
												56
											End of Borehole at 55.000m	57
												58
												59
			Type/FI	TCR	SCR	RQD	D/R/(SPT)					60

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	55.00	90	0						

Remarks

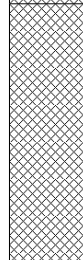
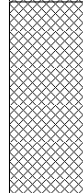
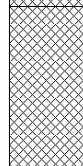
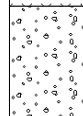
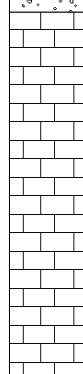
Standpipe Installation: 0.00m - 15.00m b.g.l. (50mm Plain) / 15.00m - 25.00m b.g.l. (50mm Slotted)

End of Rotary Cored Borehole at 55.00m b.g.l.



Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 31/08/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555448.30 N656263.80	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Beretta T44	
Borehole Number RC02CR	Hole Type CP+RC	Level 5.00m AoD	Logged By RC	Scale 1:50	Page Number Sheet 1 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description			
				TCR	SCR	RQD								
								0.50	4.50		Soft, brown, gravelly clay with many cobbles and boulders. [MADE GROUND]	1 - 10		
								0.80	4.20		804 Gravel. [MADE GROUND]			
											Stiff, brownish grey, gravelly clay with many cobbles and some boulders. [MADE GROUND]			
								2.50	2.50		Very stiff, light brown, slightly gravelly clay with many cobbles and some boulders. [MADE GROUND]			
								3.80	1.20		Very stiff, dark brownish grey, slightly sandy, gravelly clay with many cobbles. [MADE GROUND]			
								4.90	0.10		Soft, light grey, slightly organic SILT.			
								6.80	-1.80		Dense, light grey GRAVEL with some angular cobbles.			
								7.60	-2.60		Medium strong to strong, grey, fine grained, crystalline, partially weathered to unweathered, medium fractured LIMESTONE.			
								7.60 - 8.60	4	100	95		88	
								8.60 - 10.10	5	100	92		75	
			Type/FI	TCR	SCR	RQD	D/R/(SPT)					10		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.10	90	0						

Remarks

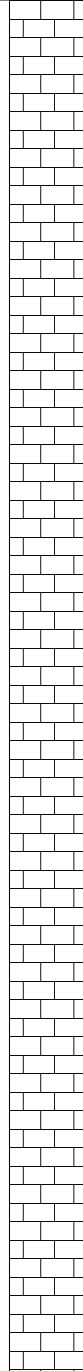
No Standpipe Installation.

End of Rotary Cored Borehole at 30.10m b.gl.



Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 31/08/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555448.30 N656263.80	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Beretta T44	
Borehole Number RC02CR	Hole Type CP+RC	Level 5.00m AoD	Logged By RC	Scale 1:50	Page Number Sheet 2 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		10.10 - 11.60	3	100	97	93		19.10	-14.10		Medium strong to strong, grey, fine grained, crystalline, partially weathered to unweathered, medium fractured LIMESTONE.	11
		11.60 - 13.10	4	100	96	84					12	
		13.10 - 14.60	4	100	96	94					13	
		14.60 - 16.10	3	100	97	93					14	
		16.10 - 17.60	3	100	97	94					15	
		17.60 - 19.10	4	100	100	97					16	
		19.10 - 20.60	3	100	92	92					17	
											18	
											19	
						20						

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.10	90	0						

Remarks

No Standpipe Installation.

End of Rotary Cored Borehole at 30.10m b.g.l.



Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation			Client: Uisce Eireann			Date: 31/08/2021		
Location: Limerick, Co. Limerick			Contractor: Whiteford Geoservices Ltd			Co-ords: E555448.30 N656263.80		
Project No. : 2099-21			Crew Name: GII			Drilling Equipment: Beretta T44		
Borehole Number RC02CR		Hole Type CP+RC		Level 5.00m AoD		Logged By RC		Page Number Sheet 3 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		20.60 - 22.10	4	100	97	93					Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	21
		22.10 - 23.60	4	100	100	89						22
		23.60 - 25.10	3	100	100	91						23
		25.10 - 26.70	3	100	94	88						24
		26.70 - 28.10	3	100	100	96						25
		28.10 - 30.10	2	100	98	98						26
												27
												28
												29
												30

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.10	90	0						

Remarks
 No Standpipe Installation.
 End of Rotary Cored Borehole at 30.10m b.gl.

Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation			Client: Uisce Eireann			Date: 31/08/2021		
Location: Limerick, Co. Limerick			Contractor: Whiteford Geoservices Ltd			Co-ords: E555448.30 N656263.80		
Project No. : 2099-21			Crew Name: GII			Drilling Equipment: Beretta T44		
Borehole Number RC02CR		Hole Type CP+RC		Level 5.00m AoD		Logged By RC		Page Number Sheet 4 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description						
				TCR	SCR	RQD											
								30.10	-25.10		Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE. End of Borehole at 30.100m	31					
												32					
												33					
												34					
												35					
												36					
												37					
												38					
												39					
												40					
Hole Diameter			Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush				
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.10	90	0						

Remarks No Standpipe Installation. End of Rotary Cored Borehole at 30.10m b.gl.																
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Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 30/08/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555434.72 N656239.66	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Beretta T44	
Borehole Number RC03CR	Hole Type CP+RC	Level 4.60m AoD	Logged By RC	Scale 1:50	Page Number Sheet 1 of 4

[illegible]

Remarks

No Standpipe Installation.

End of Rotary Cored Borehole at 30.40m b.g.l.



Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation			Client: Uisce Eireann			Date: 30/08/2021		
Location: Limerick, Co. Limerick			Contractor: Whiteford Geoservices Ltd			Co-ords: E555434.72 N656239.66		
Project No. : 2099-21			Crew Name: GII			Drilling Equipment: Beretta T44		
Borehole Number RC03CR		Hole Type CP+RC		Level 4.60m AoD		Logged By RC		Page Number Sheet 2 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		10.10 - 11.60	3	100	97	92					Medium strong to strong, grey, fine grained, crystalline, partially weathered to unweathered, medium fractured LIMESTONE.	11
		11.60 - 13.10	3	100	98	95						12
		13.10 - 14.60	3	100	100	96						14
		14.60 - 16.10	3	100	97	92						15
		16.10 - 17.60	1	100	100	100		16.10	-11.50		Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	16
		17.60 - 19.10	4	100	93	89						18
		19.10 - 20.60	1	100	100	100						19
												20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.40	90	0						

Remarks
 No Standpipe Installation.
 End of Rotary Cored Borehole at 30.40m b.g.l.

Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 30/08/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555434.72 N656239.66	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Beretta T44	
Borehole Number RC03CR	Hole Type CP+RC	Level 4.60m AoD	Logged By RC	Scale 1:50	Page Number Sheet 3 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
											Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	20
		20.60 - 22.10	2	100	100	100						21
												22
		22.10 - 23.60	3	100	100	96						23
												24
		23.60 - 25.10	3	100	100	91						25
												26
		25.10 - 26.60	3	100	100	92						27
												28
						29						
											30	
			Type/FI	TCR	SCR	RQD	D/R/(SPT)					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.40	90	0						

Remarks

No Standpipe Installation.

End of Rotary Cored Borehole at 30.40m b.g.l.



Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 30/08/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555434.72 N656239.66	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Beretta T44	
Borehole Number RC03CR	Hole Type CP+RC	Level 4.60m AoD	Logged By RC	Scale 1:50	Page Number Sheet 4 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		29.60 - 30.40	2	100	100	92		30.40	-25.80		Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE. End of Borehole at 30.400m	
												31
												32
												33
												34
												35
												36
												37
												38
												39
												40

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.40	90	0						

Remarks No Standpipe Installation. End of Rotary Cored Borehole at 30.40m b.g.l.																	
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Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation			Client: Uisce Eireann			Date: 02/09/2021		
Location: Limerick, Co. Limerick			Contractor: Whiteford Geoservices Ltd			Co-ords: E555426.68 N656257.30		
Project No. : 2099-21			Crew Name: GII			Drilling Equipment: Beretta T44		
Borehole Number RC04CR		Hole Type CP+RC		Level 4.90m AoD		Logged By RC		Page Number Sheet 1 of 4

Well	Water	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
							0.03 0.05 0.30	4.87 4.85 4.60		TOPSOIL. 804 Gravel. [MADE GROUND] Soft, greyish brown, gravelly clay with cobbles and boulders. [MADE GROUND] Firm to stiff, dark grey, gravelly clay with some cobbles and boulders. [MADE GROUND]	1
											2
											3
							4.10	0.80		Loose, dark grey, silty GRAVEL. Gravel is fine to coarse and angular.	4
							5.00	-0.10		Very soft, grey SILT.	5
											6
							6.20 6.50	-1.30 -1.60		Soft, pinkish grey, gravelly SILT with some cobbles. Medium dense to dense, light grey GRAVEL with some cobbles. Gravel is fine to coarse and angular.	7
		7.30 - 8.60	4	100	85	68	7.30	-2.40		Medium strong to strong, grey, fine grained, crystalline, partially weathered to unweathered, closely to medium fractured LIMESTONE.	8
		8.60 - 10.10	3	100	91	88					9
											10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.10	90	0						

Remarks Standpipe Installation: 0.00m - 8.00m b.g.l. (50mm Plain) / 8.00m - 16.00m b.g.l. (50mm Slotted) End of Rotary Cored Borehole at 30.10m b.g.l.																
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Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 02/09/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555426.68 N656257.30	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Beretta T44	
Borehole Number RC04CR	Hole Type CP+RC	Level 4.90m AoD	Logged By RC	Scale 1:50	Page Number Sheet 2 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		10.10 - 11.60	4	100	92	80					Medium strong to strong, grey, fine grained, crystalline, partially weathered to unweathered, closely to medium fractured LIMESTONE.	11
		11.60 - 13.10	5	100	93	74						12
		13.10 - 14.60	7	100	75	40						13
		14.60 - 16.10	3	100	96	91		14.60	-9.70		Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	14
		16.10 - 17.60	3	100	94	92						15
		17.60 - 19.10	3	100	96	94						16
		19.10 - 20.70	3	100	100	96						17
												18
												19
												20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.10	90	0						

Remarks Standpipe Installation: 0.00m - 8.00m b.g.l. (50mm Plain) / 8.00m - 16.00m b.g.l. (50mm Slotted) End of Rotary Cored Borehole at 30.10m b.g.l.																	
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Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation			Client: Uisce Eireann			Date: 02/09/2021		
Location: Limerick, Co. Limerick			Contractor: Whiteford Geoservices Ltd			Co-ords: E555426.68 N656257.30		
Project No. : 2099-21			Crew Name: GII			Drilling Equipment: Beretta T44		
Borehole Number RC04CR		Hole Type CP+RC		Level 4.90m AoD		Logged By RC		Page Number Sheet 3 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		20.70 - 21.90	3	100	97	94					Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE.	21
		21.90 - 23.50	3	100	100	100						22
		23.50 - 25.00	2	100	100	100						23
		25.00 - 26.50	4	100	92	83						24
		26.50 - 28.00	3	100	100	95						25
		28.00 - 30.10	2	100	100	95						26
												27
												28
												29
												30

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.10	90	0						

Remarks Standpipe Installation: 0.00m - 8.00m b.g.l. (50mm Plain) / 8.00m - 16.00m b.g.l. (50mm Slotted) End of Rotary Cored Borehole at 30.10m b.g.l.																	
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Rotary Core Log

Project Name: Limerick WWTP Upgrade Projects - Site Investigation		Client: Uisce Eireann		Date: 02/09/2021	
Location: Limerick, Co. Limerick		Contractor: Whiteford Geoservices Ltd		Co-ords: E555426.68 N656257.30	
Project No. : 2099-21		Crew Name: GII		Drilling Equipment: Beretta T44	
Borehole Number RC04CR	Hole Type CP+RC	Level 4.90m AoD	Logged By RC	Scale 1:50	Page Number Sheet 4 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
								30.10	-25.20		Strong, grey, fine grained, crystalline, partially weathered to unweathered, medium to widely fractured LIMESTONE. End of Borehole at 30.100m	
												31
												32
												33
												34
												35
												36
												37
												38
												39
												40

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	30.10	90	0						

Remarks Standpipe Installation: 0.00m - 8.00m b.g.l. (50mm Plain) / 8.00m - 16.00m b.g.l. (50mm Slotted) End of Rotary Cored Borehole at 30.10m b.g.l.																	
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APPENDIX C

IN-SITU TESTING RESULTS

PACKER TESTING

5 x A4

Packer Permeability Test



Client: Uisce Eireann
Project: Limerick WWTP Upgrades Project - Site Investigation
Site: Corcanree Pumping Station

Test Position: RC01CR

Easting	Northing	Elevation (mAOD)
555463.40	656236.16	4.50

Test Date: 27/08/2021

Packer Type: Double

Depth of Hole (m): 55.00

Diameter of Hole (mm): 98

Top of Test Section (m): 10.00

Centre of Test Section (m): 11.50

Bottom of Test Section (m): 13.00

Initial Groundwater Level (m) b.g.l. : 3.86

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
1 / 40 kPa	Flowmeter (litres)	0.543	0.546	0.547	0.547	0.00027 L / min
	Water take (litres)	0	0.003	0.001	0	Total = 0.004 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
2 / 80 kPa	Flowmeter (litres)	0.547	0.547	0.548	0.548	0.000067 L / min
	Water take (litres)	0	0	0.001	0	Total = 0.001 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
3 / 160 kPa	Flowmeter (litres)	0.561	0.565	0.575	0.587	0.0026 L / min
	Water take (litres)	0.013	0.004	0.01	0.012	Total = 0.039 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
4 / 80 kPa	Flowmeter (litres)	0.589	0.590	0.590	0.591	0.00027 L / min
	Water take (litres)	0.002	0.001	0	0.001	Total = 0.004 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
5 / 40 kPa	Flowmeter (litres)	0.591	0.592	0.592	0.592	0.000067 L / min
	Water take (litres)	0	0.001	0	0	Total = 0.001 L

Packer Permeability Test



Client: Uisce Eireann
Project: Limerick WWTP Upgrades Project - Site Investigation
Site: Corcanree Pumping Station

Test Position: RC01CR

Easting	Northing	Elevation (mAOD)
555463.40	656236.16	4.50

Test Date: 27/08/2021

Packer Type: Double

Depth of Hole (m): 55.00

Diameter of Hole (mm): 98

Top of Test Section (m): 14.00

Centre of Test Section (m): 15.50

Bottom of Test Section (m): 17.00

Initial Groundwater Level (m) b.g.l. : 3.82

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
1 / 50 kPa	Flowmeter (litres)	0.307	0.307	0.402	0.487	0.012 L / min
	Water take (litres)	0	0	0.095	0.085	Total = 0.18 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
2 / 100 kPa	Flowmeter (litres)	0.487	0.489	0.49	0.493	0.0004 L / min
	Water take (litres)	0	0.002	0.001	0.003	Total = 0.006 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
3 / 200 kPa	Flowmeter (litres)	0.502	0.518	0.531	0.542	0.0033 L / min
	Water take (litres)	0.009	0.016	0.013	0.011	Total = 0.049 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
4 / 100 kPa	Flowmeter (litres)	0.542	0.542	0.543	0.543	0.000067 L / min
	Water take (litres)	0	0	0.001	.	Total = 0.001 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
5 / 50 kPa	Flowmeter (litres)	0.543	0.543	0.543	0.543	0.00 L / min
	Water take (litres)	0	0	0	0	Total = 0.00 L

Packer Permeability Test



Client: Uisce Eireann
 Project: Limerick WWTP Upgrades Project - Site Investigation
 Site: Corcanree Pumping Station

Test Position: RC02CR

Easting	Northing	Elevation (mAOD)
555448.30	656263.80	5.00

Test Date: 02/09/2021

Packer Type: Double

Depth of Hole (m): 30.10

Diameter of Hole (mm): 98

Top of Test Section (m): 8.50

Centre of Test Section (m): 10.00

Bottom of Test Section (m): 11.50

Initial Groundwater Level (m) b.g.l. : 5.35

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
1 / 70 kPa	Flowmeter (litres)	9.460	9.700	9.900	10.060	0.04 L / min
	Water take (litres)	0	0.24	0.2	0.16	Total = 0.6 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
2 / 105 kPa	Flowmeter (litres)	10.060	10.350	10.580	10.800	0.049 L / min
	Water take (litres)	0	0.29	0.23	0.22	Total = 0.74 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
3 / 140 kPa	Flowmeter (litres)	10.800	11.240	11.600	11.960	0.077 L / min
	Water take (litres)	0	0.44	0.36	0.36	Total = 1.16 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
4 / 105 kPa	Flowmeter (litres)	11.960	12.310	12.710	13.020	0.071 L / min
	Water take (litres)	0	0.35	0.4	0.31	Total = 1.06 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
5 / 70 kPa	Flowmeter (litres)	13.020	13.260	13.460	13.680	0.044 L / min
	Water take (litres)	0	0.24	0.2	0.22	Total = 0.66 L

Packer Permeability Test



Client: Uisce Eireann
Project: Limerick WWTP Upgrades Project - Site Investigation
Site: Corcanree Pumping Station

Test Position: RC02CR

Easting	Northing	Elevation (mAOD)
555448.30	656263.80	5.00

Test Date: 01/09/2021

Packer Type: Double

Depth of Hole (m): 30.10

Diameter of Hole (mm): 98

Top of Test Section (m): 17.00

Centre of Test Section (m): 18.50

Bottom of Test Section (m): 20.00

Initial Groundwater Level (m) b.g.l. : 5.12

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
1 / 110 kPa	Flowmeter (litres)	5.680	6.340	6.490	6.840	0.077 L / min
	Water take (litres)	0	0.66	0.15	0.35	Total = 1.16 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
2 / 165 kPa	Flowmeter (litres)	6.840	7.120	7.310	7.380	0.036 L / min
	Water take (litres)	0	0.28	0.19	0.07	Total = 0.54 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
3 / 220 kPa	Flowmeter (litres)	7.380	7.480	7.810	8.160	0.052 L / min
	Water take (litres)	0	0.1	0.33	0.35	Total = 0.78 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
4 / 165 kPa	Flowmeter (litres)	8.160	8.460	8.670	8.880	0.048 L / min
	Water take (litres)	0	0.3	0.21	0.21	Total = 0.72 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
5 / 110 kPa	Flowmeter (litres)	8.880	9.010	9.230	9.460	0.039 L / min
	Water take (litres)	0	0.13	0.22	0.23	Total = 0.58 L

Packer Permeability Test



Client: Uisce Eireann
Project: Limerick WWTP Upgrades Project - Site Investigation
Site: Corcanree Pumping Station

Test Position: RC04CR

Easting	Northing	Elevation (mAOD)
555426.68	656257.30	4.90

Test Date: 06/09/2021

Packer Type: Double

Depth of Hole (m): 30.10

Diameter of Hole (mm): 98

Top of Test Section (m): 12.00

Centre of Test Section (m): 13.50

Bottom of Test Section (m): 15.00

Initial Groundwater Level (m) b.g.l. : 5.20

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
1 / 90 kPa	Flowmeter (litres)	1.400	1.438	1.469	1.502	0.0068 L / min
	Water take (litres)	0	0.038	0.031	0.033	Total = 0.102 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
2 / 135 kPa	Flowmeter (litres)	1.502	1.551	1.598	1.634	0.0088 L / min
	Water take (litres)	0	0.049	0.047	0.036	Total = 0.132 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
3 / 180 kPa	Flowmeter (litres)	1.634	1.690	1.736	1.784	0.01 L / min
	Water take (litres)	0	0.056	0.046	0.048	Total = 0.15 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
4 / 135 kPa	Flowmeter (litres)	1.784	1.830	1.871	1.915	0.0087 L / min
	Water take (litres)	0	0.046	0.041	0.044	Total = 0.131 L

Test Period / Pressure (kPa)	Time Period (mins)	0	5	10	15	Average Flow q
5 / 90 kPa	Flowmeter (litres)	1.915	1.939	1.963	1.985	0.0047 L / min
	Water take (litres)	0	0.024	0.024	0.022	Total = 0.07 L

APPENDIX D

LABORATORY TESTING RESULTS

NATURAL MOISTURE CONTENT	1 x A4
ATTERBERG LIMITS	1 x A4
PARTICLE SIZE DISTRIBUTION (PSD) / SEDIMENTATION	18 x A4
CHEMICAL CONTENT	6 x A4
OEDOMETER 1D CONSOLIDATION	10 x A4
POINT LOAD TESTING	2 x A4
UNIAXIAL COMPRESSIVE STRENGTH (UCS)	3 x A4
POROSITY / DENSITY	2 x A4
SLAKE DURABILITY INDEX	1 x A4
LOS ANGELES ABRASION VALUE	1 x A4

Moisture Content Results



Location: Corcanree PS

Job No: 2099-21

Client: Irish Water

Sample no:	Depth (m)	Water Content (%)
BH01CR	2.0	9.6
BH01CR	3.0	10.6
BH01CR	4.0	43.9
BH01CR	4.5	70.3
BH01CR	5.0	23.9
BH01CR	6.0	3.3
BH02CR	1.0	11.2
BH02CR	4.0	19.4
BH02CR	5.0	50.1
BH02CR	6.0	44.6
BH03ACR	3.5	30.7
BH03ACR	4.0	52.6
BH03ACR	4.5	40.4
BH03ACR	5.0	26.5
BH04CR	2.5	13.0
BH04CR	3.5	9.6
BH04CR	4.5	21.0
BH04CR	5.5	51.9
BH05CR	1.0	7.5
BH05CR	5.0	7.5
BH06CR	1.5	18.8
BH06CR	2.5	20.9
BH06CR	4.5	77.2
BH06CR	6.5	107.3
BH06CR	8.5	8.1
TP01CR	2.0	6.7
TP01CR	4.0	10.2
TP02CR	3.0	49.6

Testing Carried out by Queens University Belfast

Operator	Checked	Approved
QUB / SV	SV	JMCN

BS 1377 Part 2: 1990

Atterberg Limits



Location: Corcanree PS

Client: Irish Water

Job No: 2099-21

Hole ID	Depth (m)	425 % PASS	LL (%)	PL (%)	PI (%)	Sample References	Results
BH01CR	2.0	45.0	25	14	11	Refer to Log	CLAY OF LOW PLASTICITY
BH01CR	3.0	54.0	25	14	11	Refer to Log	CLAY OF LOW PLASTICITY
BH01CR	4.0	92.0	62	26	36	Refer to Log	CLAY OF HIGH PLASTICITY
BH01CR	5.0	27.0	36	17	19	Refer to Log	CLAY OF INTERMEDIATE PLASTICITY
BH02CR	4.0	74.0	69	24	45	Refer to Log	CLAY OF HIGH PLASTICITY
BH02CR	5.0	97.0	73	31	42	Refer to Log	CLAY OF VERY HIGH PLASTICITY
BH03ACR	4.0	93.0	76	35	41	Refer to Log	CLAY OF VERY HIGH PLASTICITY
BH03ACR	5.0	81.0	64	24	40	Refer to Log	CLAY OF HIGH PLASTICITY
BH04CR	3.5	17.0	37	20	17	Refer to Log	CLAY OF INTERMEDIATE PLASTICITY
BH04CR	5.5	100.0	86	31	55	Refer to Log	CLAY OF HIGH PLASTICITY
BH05CR	1.0	40.0	24	13	11	Refer to Log	CLAY OF LOW PLASTICITY
BH05CR	5.0	13.0	38	20	18	Refer to Log	CLAY OF INTERMEDIATE PLASTICITY
BH06CR	1.0	41.0	62	25	37	Refer to Log	CLAY OF HIGH PLASTICITY
BH06CR	2.5	87.0	34	18	16	Refer to Log	CLAY OF LOW PLASTICITY
BH06CR	4.5	100.0	116	42	74	Refer to Log	CLAY OF EXTREMELY HIGH PLASTICITY
BH06CR	6.5	93.0	141	48	93	Refer to Log	CLAY OF EXTREMELY HIGH PLASTICITY
TP01CR	2.0	30.0	26	14	12	Refer to Log	CLAY OF LOW PLASTICITY
TP01CR	4.0	30.0	25	14	11	Refer to Log	CLAY OF LOW PLASTICITY
				Operator	Checked	Approved	
				SV	JM	JW	

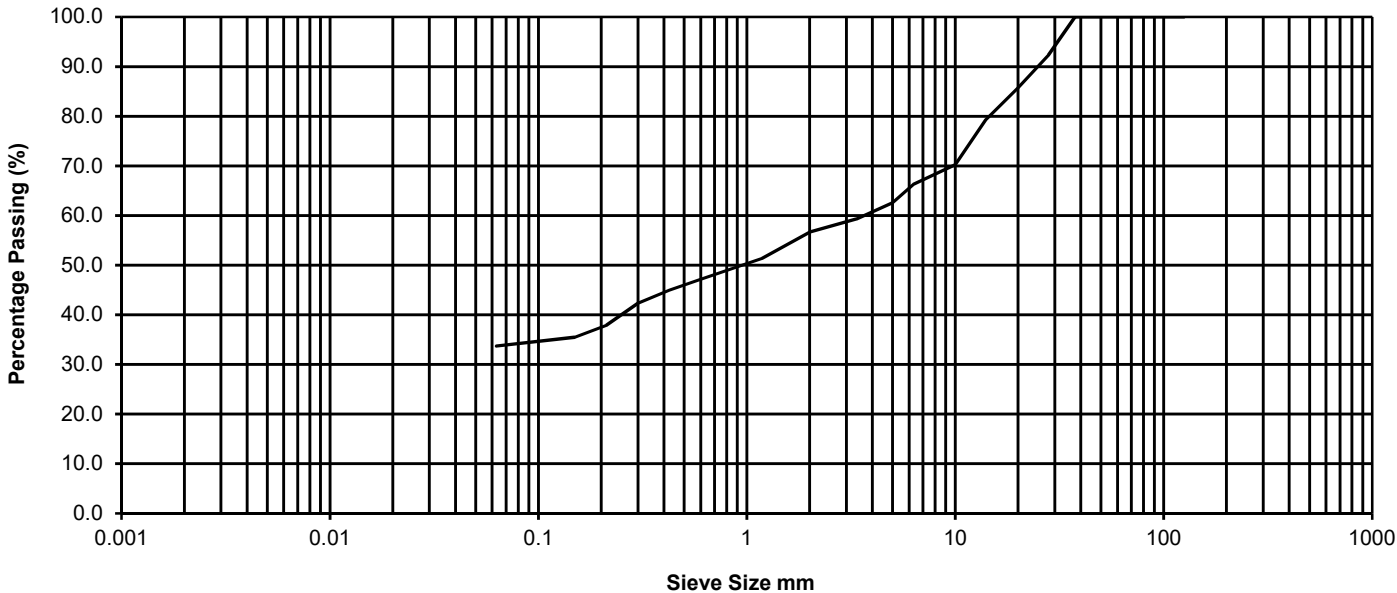
TESTS CARRIED OUT BY DR SIVAKUMAR VINAYAGAMOTHY OF QUEENS UNIVERSITY BELFAST

VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	92.3
20.000	85.7
14.000	79.3
10.000	70.3
6.300	66.3
5.000	62.6
3.350	59.3
2.000	56.6
1.180	51.3
0.600	47.1
0.425	44.9
0.300	42.3
0.212	37.9
0.150	35.5
0.063	33.7

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	33.7			22.9			43.4				
										0.0	0.0

Sample Description Gravelly sandy SILT

Project No. 2099-21

BH/TP No. BH01CR

Sample No.

Project	Limerick (Corcanree)
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Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	2.0m
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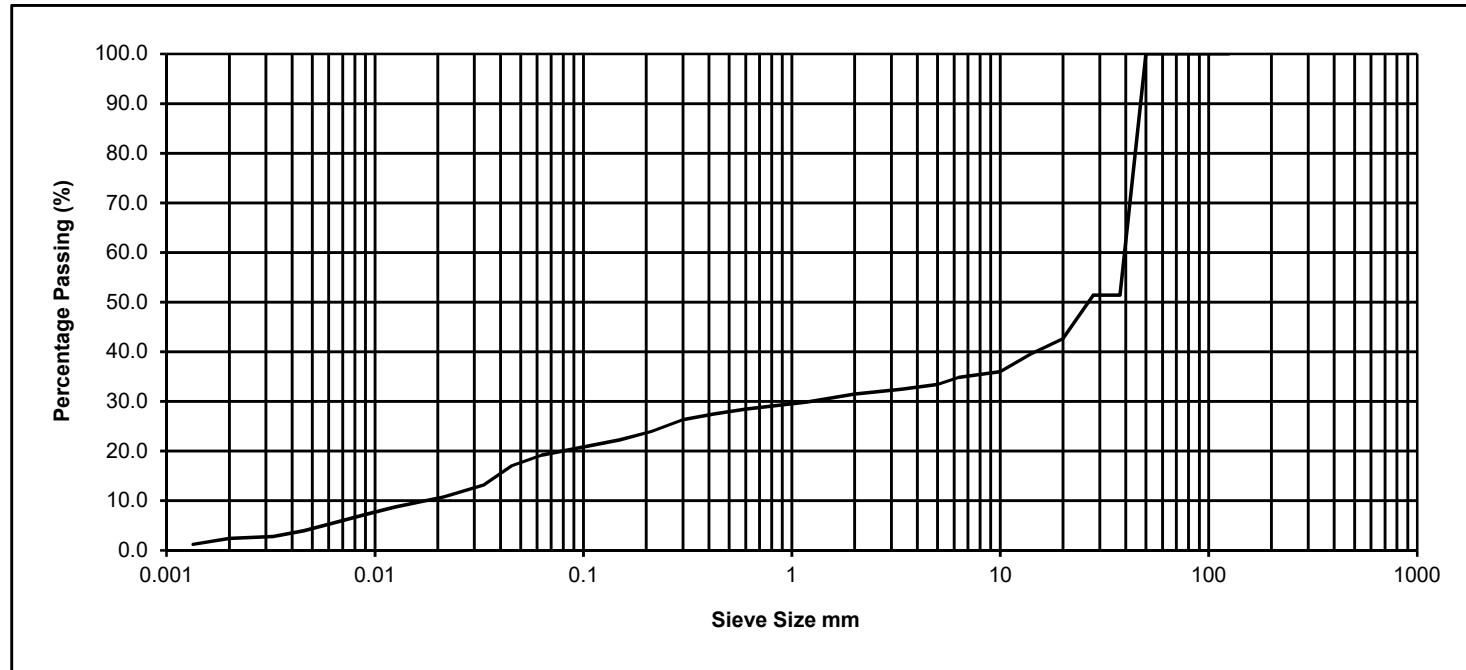
Depth	2.0m
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VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	51.4
28.000	51.4
20.000	42.7
14.000	39.6
10.000	36.0
6.300	34.8
5.000	33.4
3.350	32.5
2.000	31.5
1.180	29.9
0.600	28.4
0.425	27.5
0.300	26.3
0.212	23.9
0.150	22.3
0.063	19.2
0.045	17.1
0.033	13.1
0.021	10.7
0.012	8.7
0.009	7.1
0.006	5.6
0.005	4.0
0.003	2.8
0.002	2.4
0.001	1.2

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size									
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse
	Silt			Sand			Gravel		
	16.8			12.3			68.5		
							0.0		
							0.0		

Sample Description Silty sandy GRAVEL

Project No. 2099-21

BH/TP No. BH01CR

Project Limerick (Corcanree)

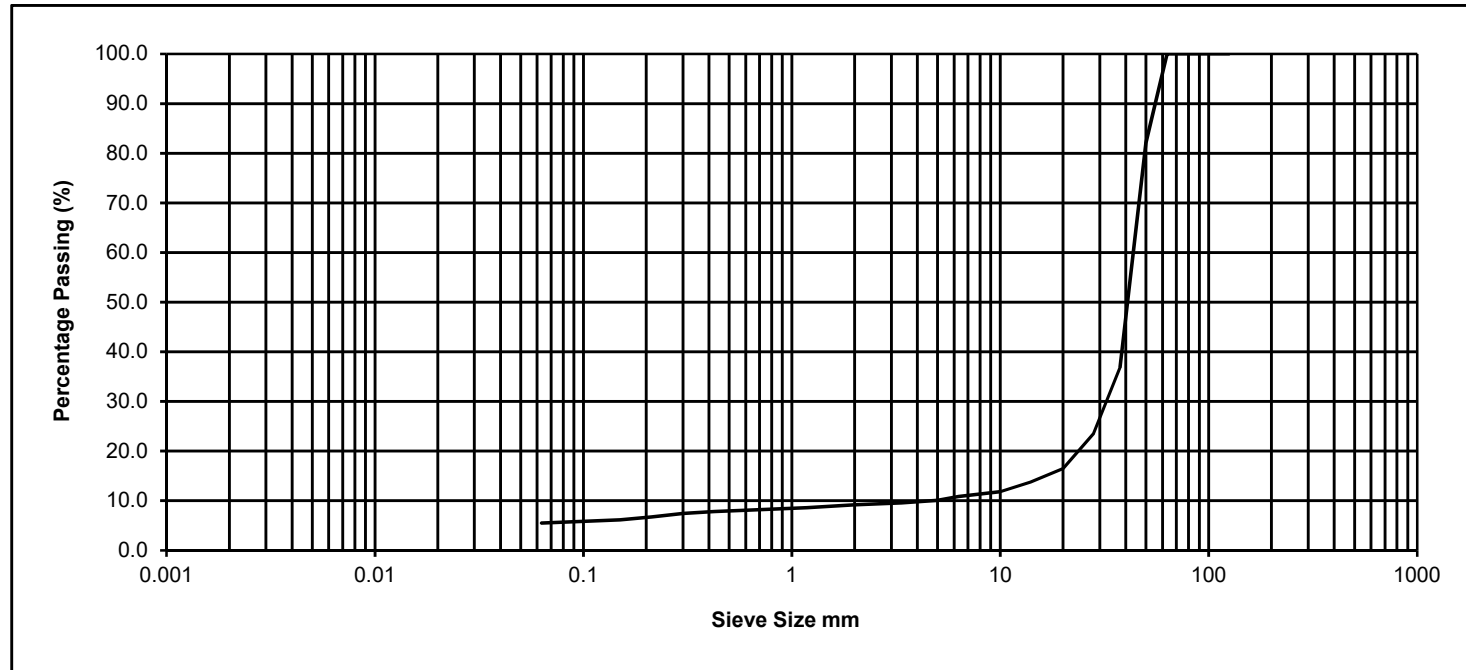
Sample No.

Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	5.0m
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VINI Geotechnical Testing[illegible]

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	5.5			3.7			90.8				
										0.0	0.0

Sample Description Silty sandy GRAVEL

Project No. 2099-21

BH/TP No. BH01CR

Project	Limerick (Corcanree)
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Sample No.

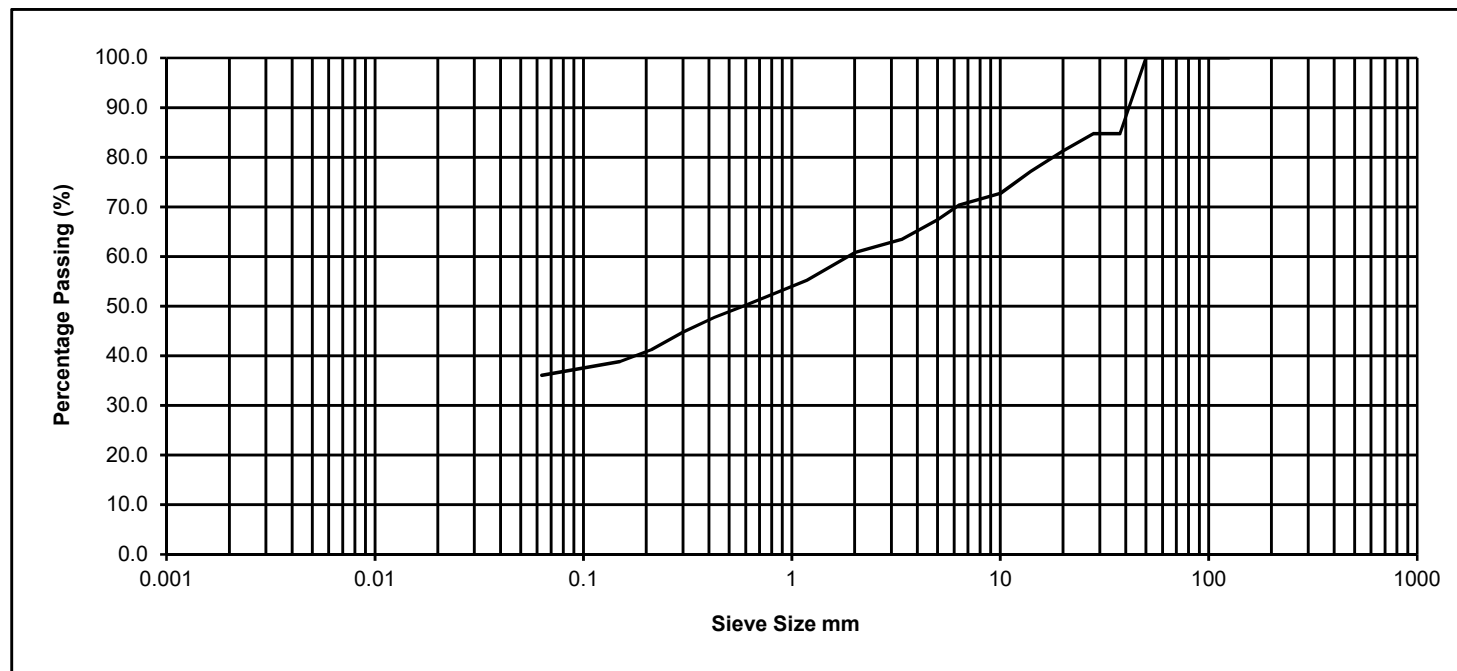
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	6.0m
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VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	84.7
28.000	84.7
20.000	81.3
14.000	77.1
10.000	72.7
6.300	70.3
5.000	67.4
3.350	63.4
2.000	60.7
1.180	55.2
0.600	50.2
0.425	47.7
0.300	44.8
0.212	41.2
0.150	38.8
0.063	36.1

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	36.1			24.7			39.3				
										0.0	0.0

Sample Description	Gravelly sandy SILT	Project No.	2099-21
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Project No. 2099-21

BH/TP No. BH02CR

Project	Limerick (Corcanree)	Sample No.
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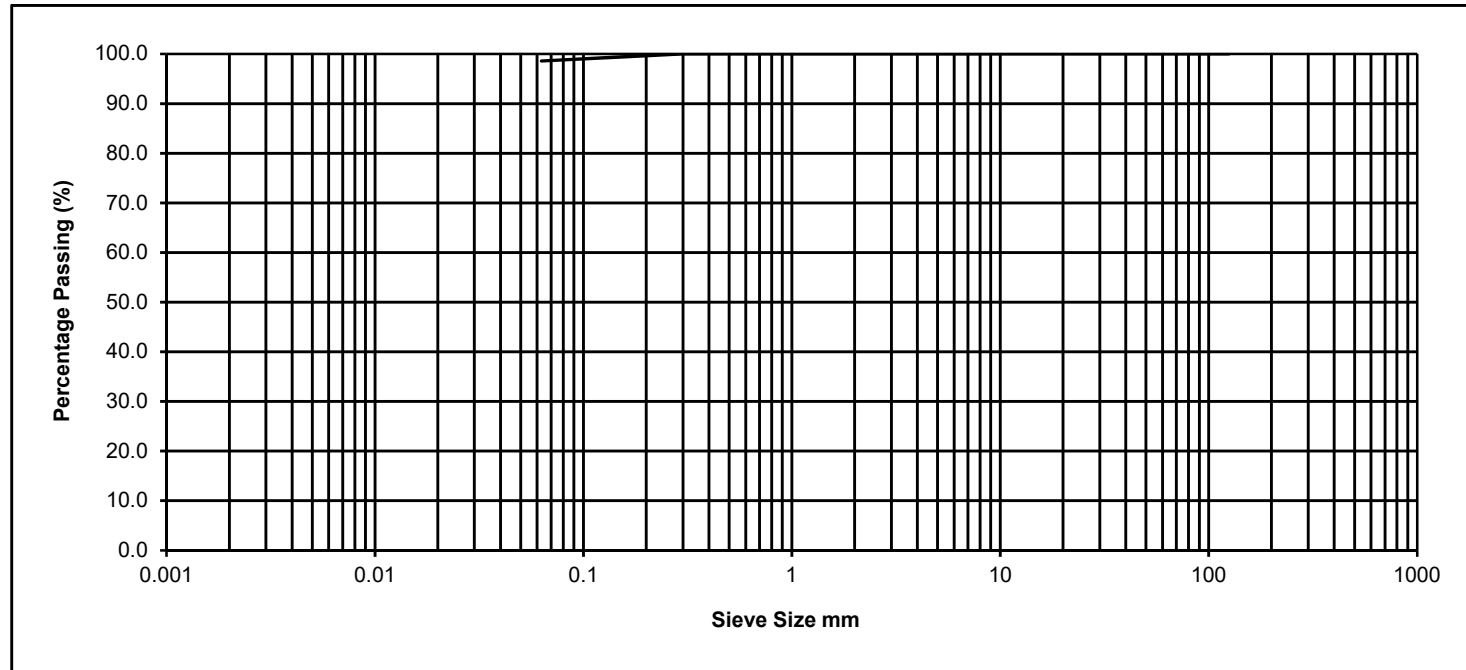
Sample No.

Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	1.0m
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VINI Geotechnical Testing[illegible]

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	98.6			1.4			0.0				
										0.0	0.0

Sample Description Silty CLAY

Project No. 2099-21

BH/TP No. BH02CR

Project	Limerick (Corcanree)
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Sample No.

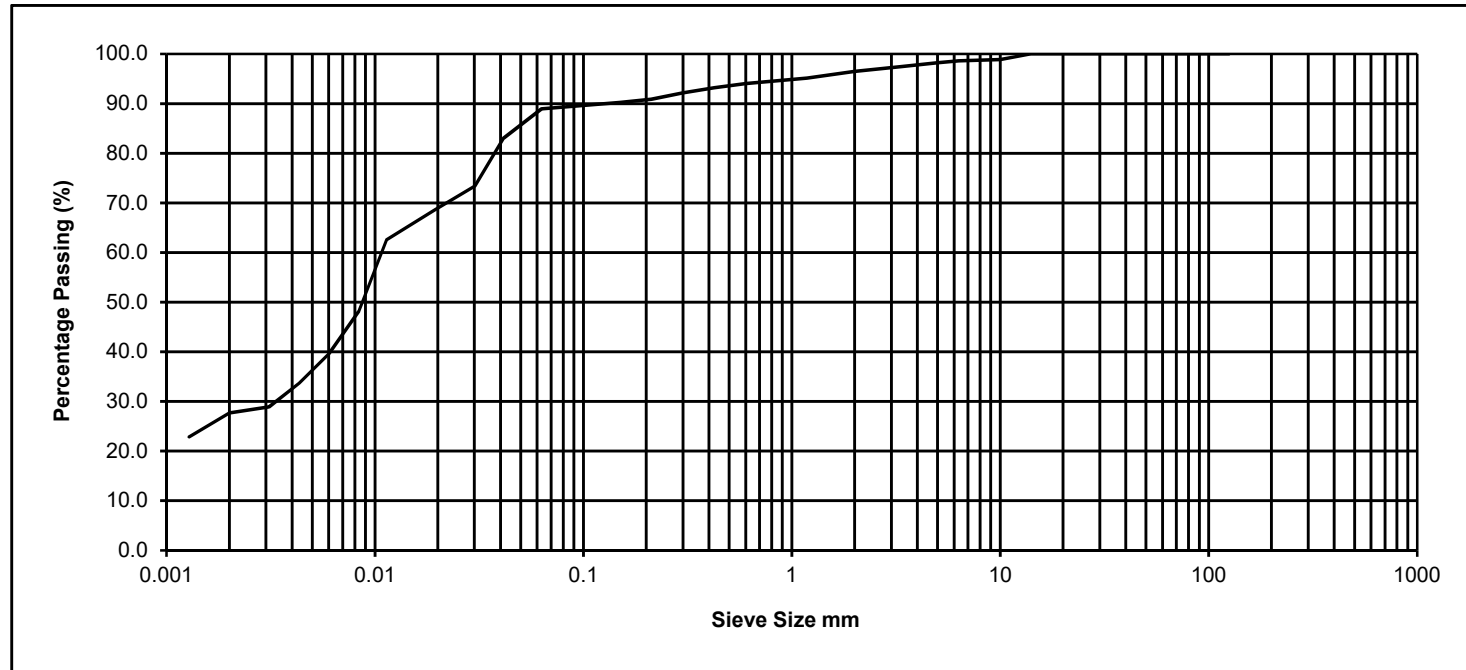
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	6.0m
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VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	98.9
6.300	98.6
5.000	98.2
3.350	97.5
2.000	96.5
1.180	95.1
0.600	94.0
0.425	93.2
0.300	92.2
0.212	90.9
0.150	90.2
0.063	88.9
0.041	83.0
0.030	73.4
0.019	68.6
0.011	62.6
0.008	48.1
0.006	39.7
0.004	33.7
0.003	28.9
0.002	27.7
0.001	22.9

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder	
	Silt			Sand			Gravel					
	61.2			7.6			3.5					
											0.0	0.0

Sample Description Sandy silty CLAY

Project No. 2099-21

BH/TP No. BH03CR

Project Limerick (Corcanree)

Sample No.

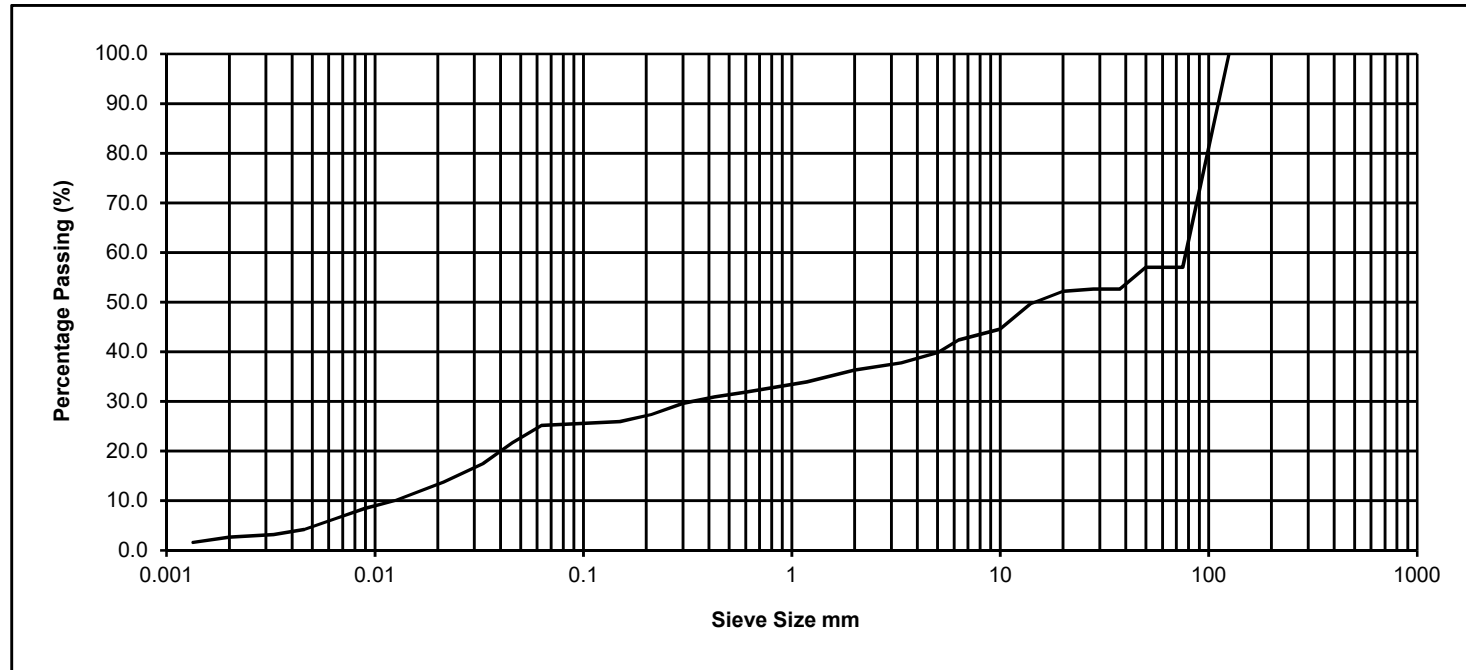
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	4.0m
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VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	57.0
63.000	57.0
50.000	57.0
37.500	52.6
28.000	52.6
20.000	52.2
14.000	49.7
10.000	44.5
6.300	42.4
5.000	39.8
3.350	37.7
2.000	36.3
1.180	33.9
0.600	31.9
0.425	30.9
0.300	29.6
0.212	27.4
0.150	26.0
0.063	25.2
0.046	21.7
0.033	17.5
0.021	13.8
0.013	10.1
0.009	8.5
0.006	6.4
0.005	4.2
0.003	3.2
0.002	2.6
0.001	1.6

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	22.5			11.2			20.7				
										43.0	0.0

Sample Description Gravelly sandy SILT cont Cobbles

Project No. 2099-21

BH/TP No. BH04CR

Project Limerick (Corcanree)

Sample No.

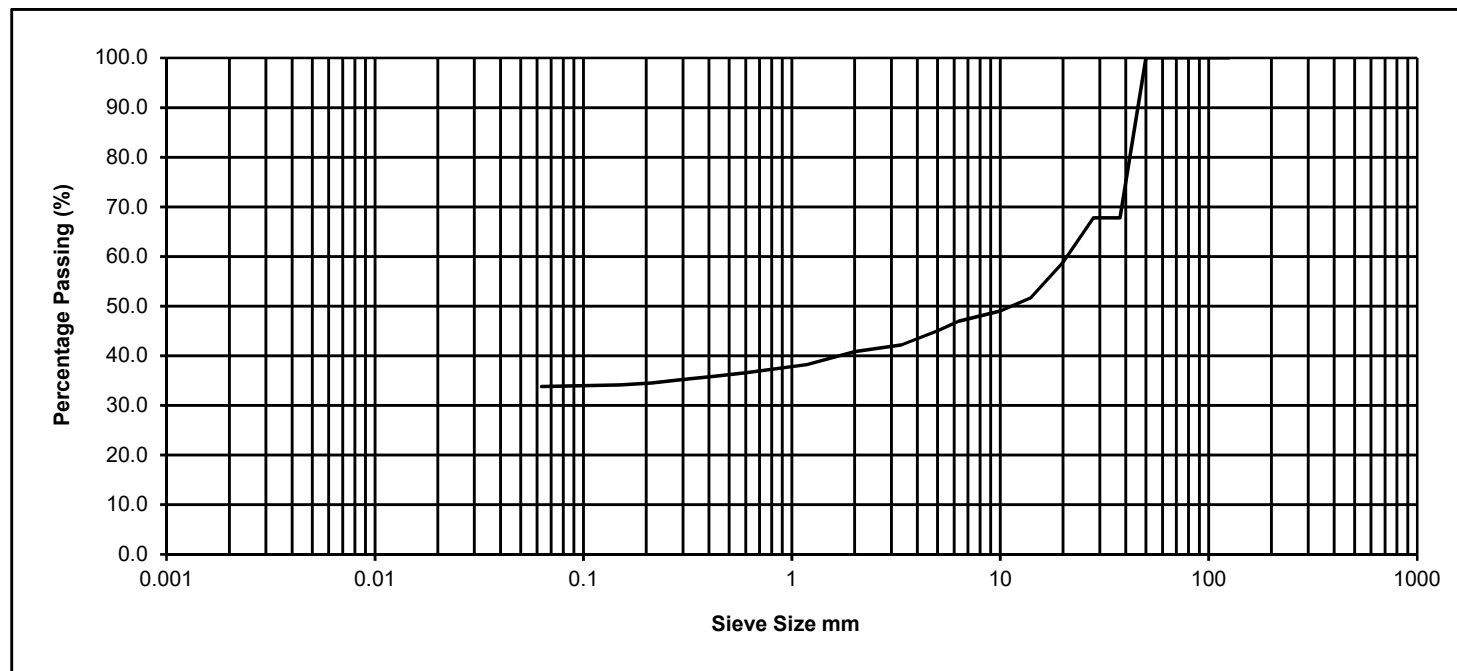
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	2.5m
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VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	67.8
28.000	67.8
20.000	58.8
14.000	51.7
10.000	49.0
6.300	46.9
5.000	45.0
3.350	42.2
2.000	40.8
1.180	38.2
0.600	36.6
0.425	35.9
0.300	35.2
0.212	34.5
0.150	34.2
0.063	33.8

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	33.8			7.0			59.2				
										0.0	0.0

Sample Description	Sandy silty GRAVEL	Project No.	2099-21
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Project No. 2099-21

BH/TP No. BH06CR

Project	Limerick (Corcanree)	Sample No.
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Sample No.

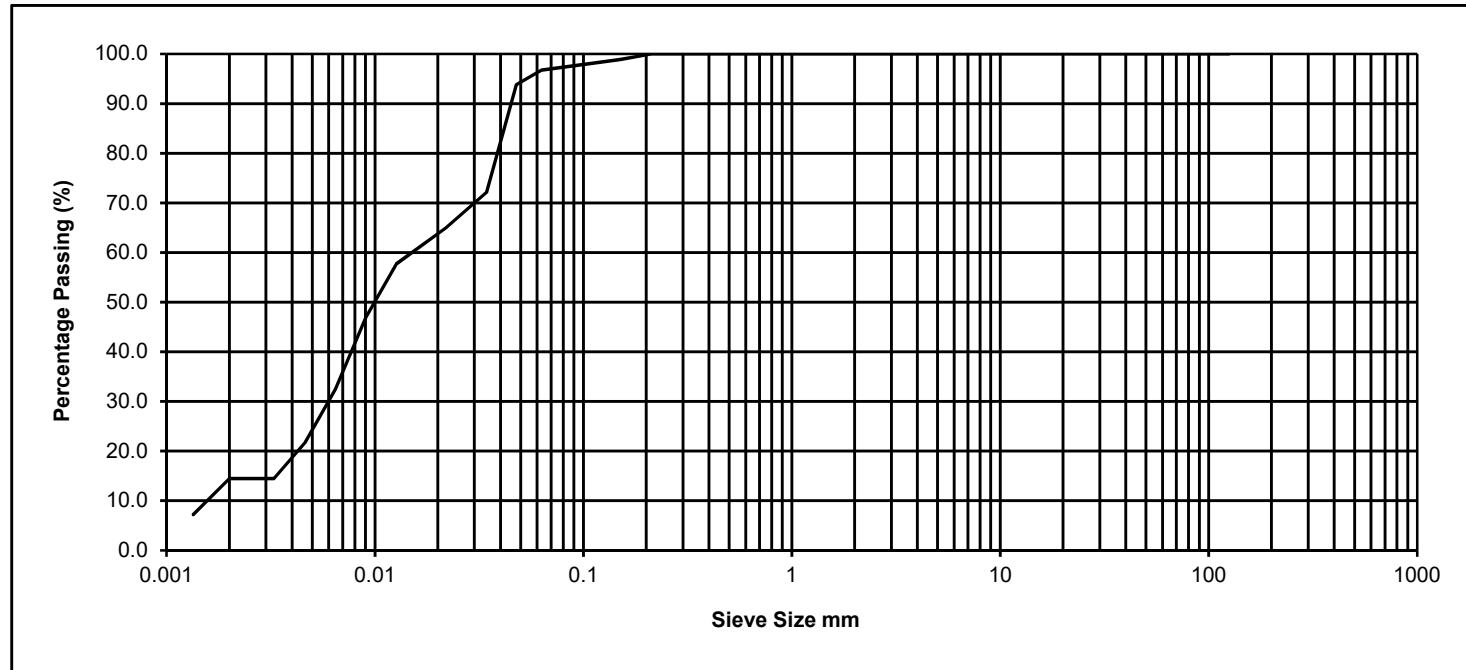
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	1.0m
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VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	100.0
0.425	100.0
0.300	100.0
0.212	100.0
0.150	98.9
0.063	96.8
0.048	93.9
0.034	72.2
0.022	65.0
0.013	57.8
0.009	46.9
0.006	32.5
0.005	21.7
0.003	14.4
0.002	14.4
0.001	7.2

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	82.3			3.2			0.0				
										0.0	0.0

Sample Description Sandy silty CLAY

Project No. 2099-21

BH/TP No. BH04CR

Project Limerick (Corcanree)

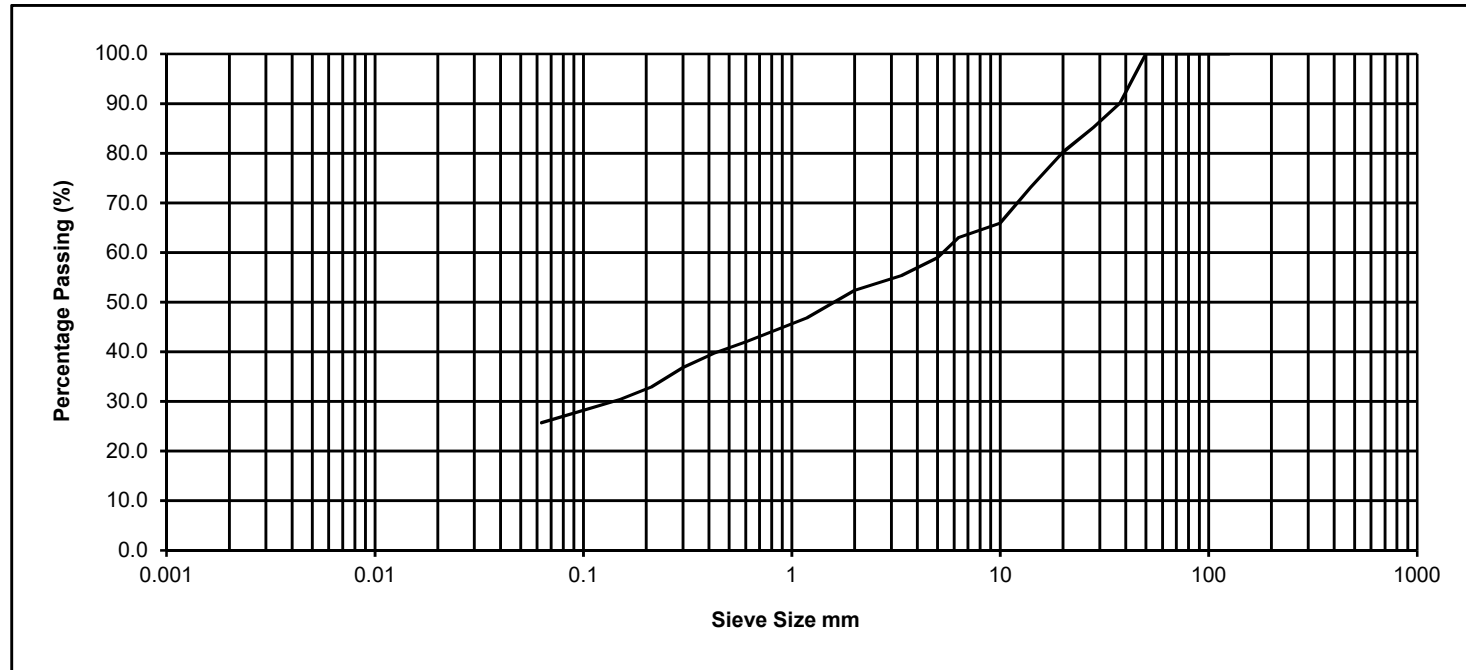
Sample No.

Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	5.5m
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VINI Geotechnical Testing[illegible]

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size										Cobbles	Boulder
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	25.7			26.7			47.6			0.0	0.0

Sample Description Silty sandy GRAVEL

Project No. 2099-21

BH/TP No. BH05CR

Project	Limerick (Corcanree)
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Sample No.

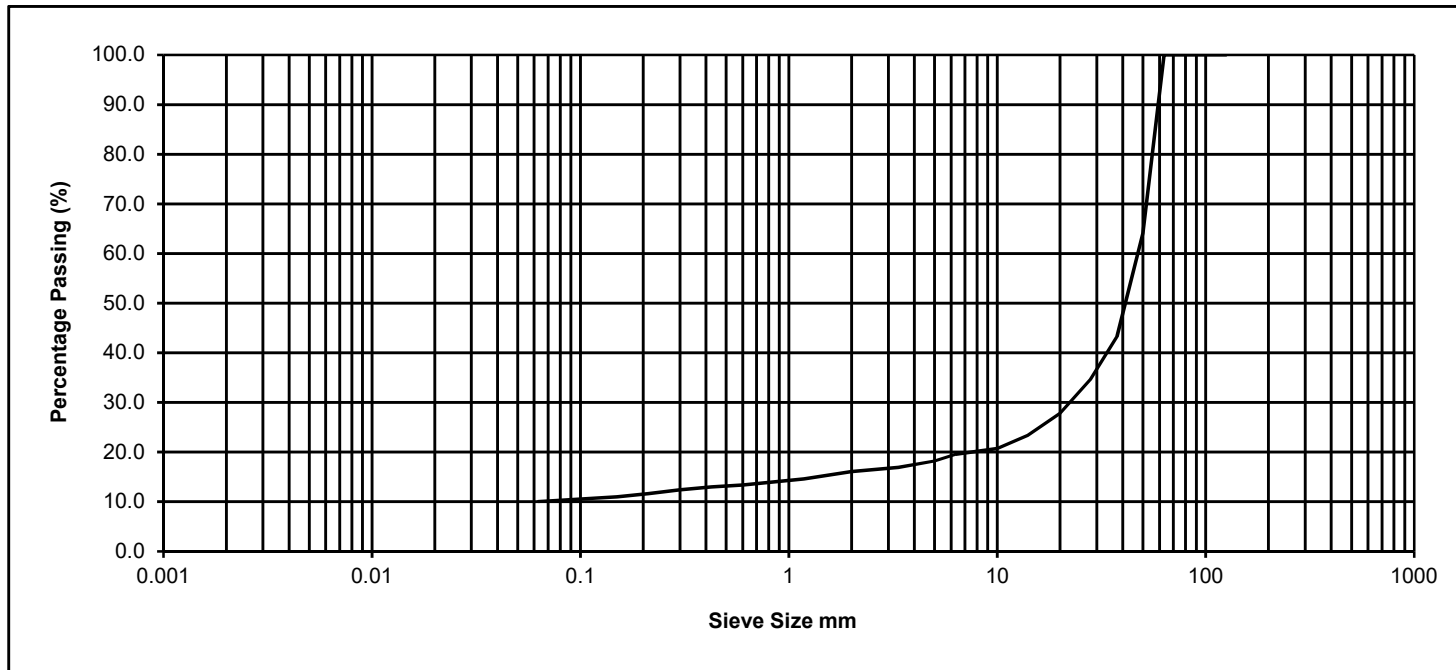
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	1.0m
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VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	64.1
37.500	43.3
28.000	34.7
20.000	27.8
14.000	23.4
10.000	20.7
6.300	19.5
5.000	18.2
3.350	16.9
2.000	16.1
1.180	14.6
0.600	13.3
0.425	13.0
0.300	12.4
0.212	11.6
0.150	11.0
0.063	10.0

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size										Cobbles	Boulder
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	10.0			6.0			83.9			0.0	0.0

Sample Description Silty sandy GRAVEL

Project No. 2099-21

BH/TP No. BH05CR

Sample No.

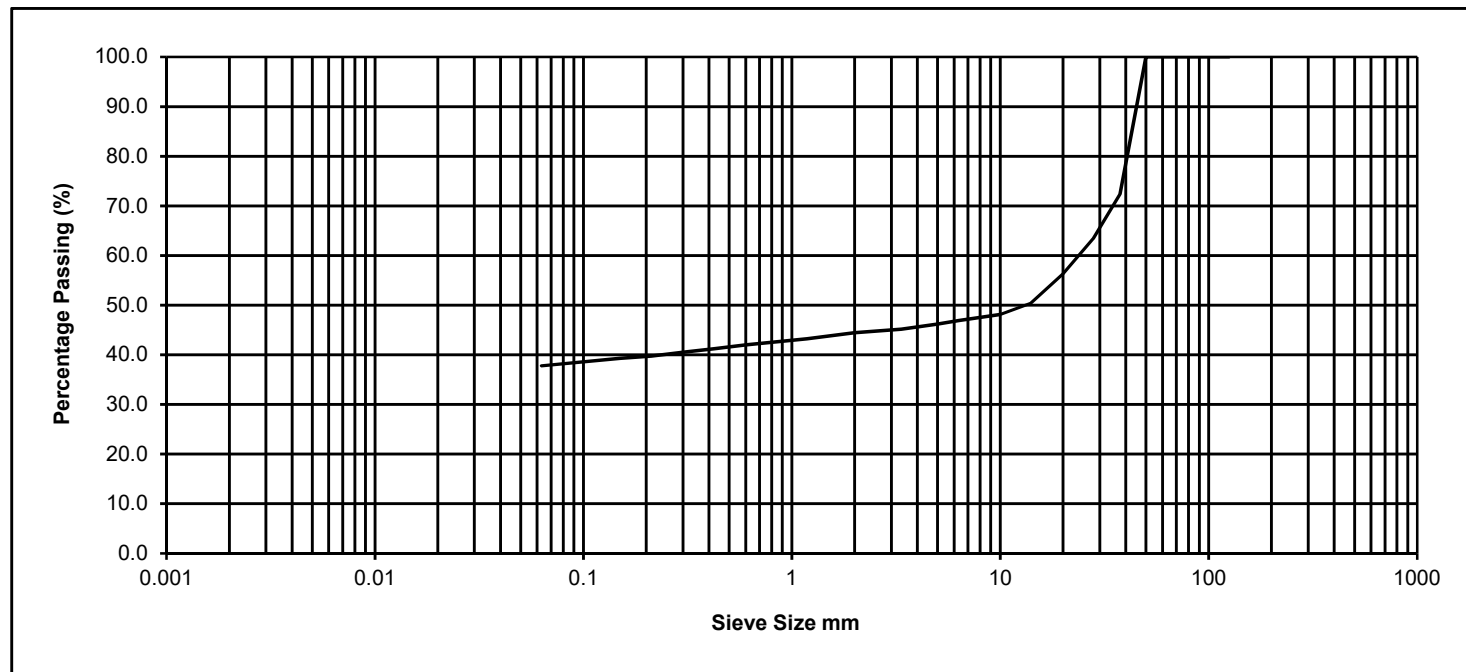
Project	Limerick (Corcanree)
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Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	5.0m
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Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	5.0m
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[illegible]

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size										Cobbles	Boulder
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	37.8			6.7			55.6			0.0	0.0

Sample Description Gravelly sandy SILT

Project No. 2099-21

BH/TP No. BH06CR

Sample No.

Project	Limerick (Corcanree)
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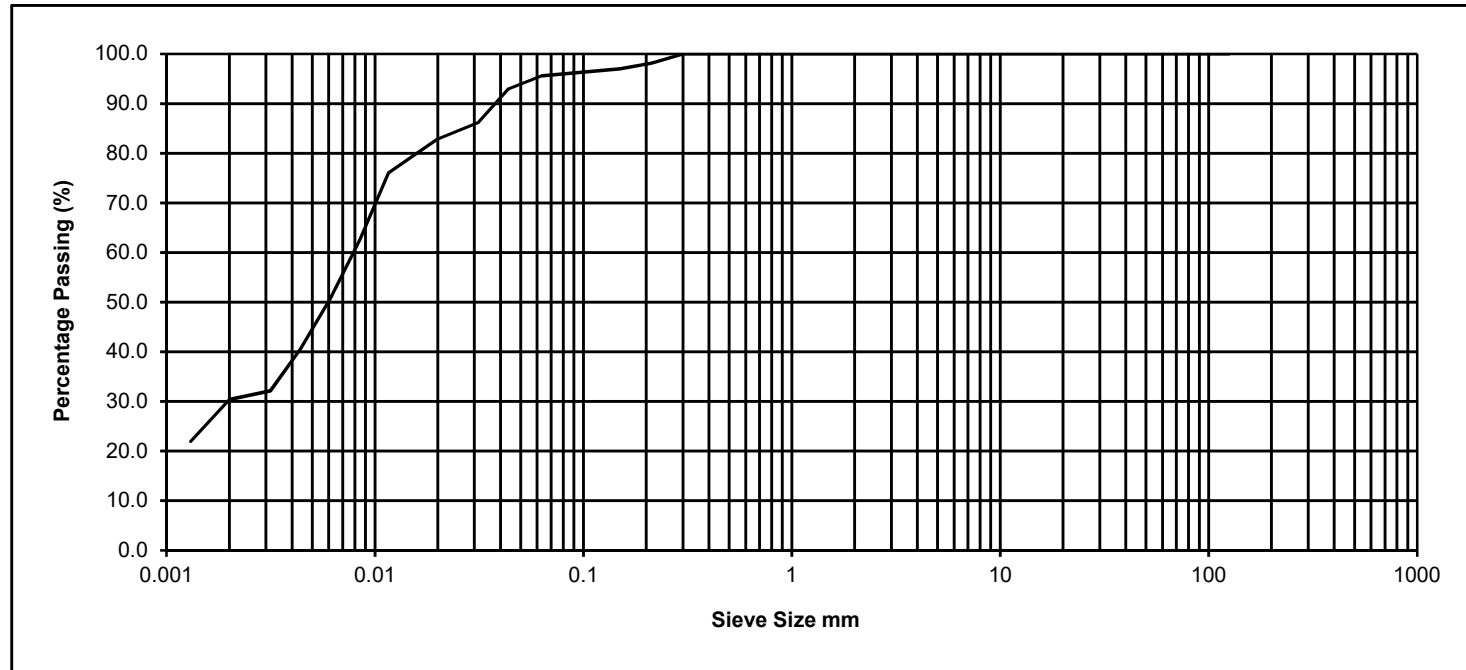
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	1.0m
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VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	100.0
10.000	100.0
6.300	100.0
5.000	100.0
3.350	100.0
2.000	100.0
1.180	100.0
0.600	100.0
0.425	100.0
0.300	100.0
0.212	98.1
0.150	97.0
0.063	95.6
0.044	92.9
0.031	86.2
0.020	82.8
0.012	76.0
0.008	62.5
0.006	50.7
0.004	40.6
0.003	32.1
0.002	30.4
0.001	22.0

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	65.2			4.4			0.0				
										0.0	0.0

Sample Description Sandy silty CLAY

Project No. 2099-21

BH/TP No. BH06CR

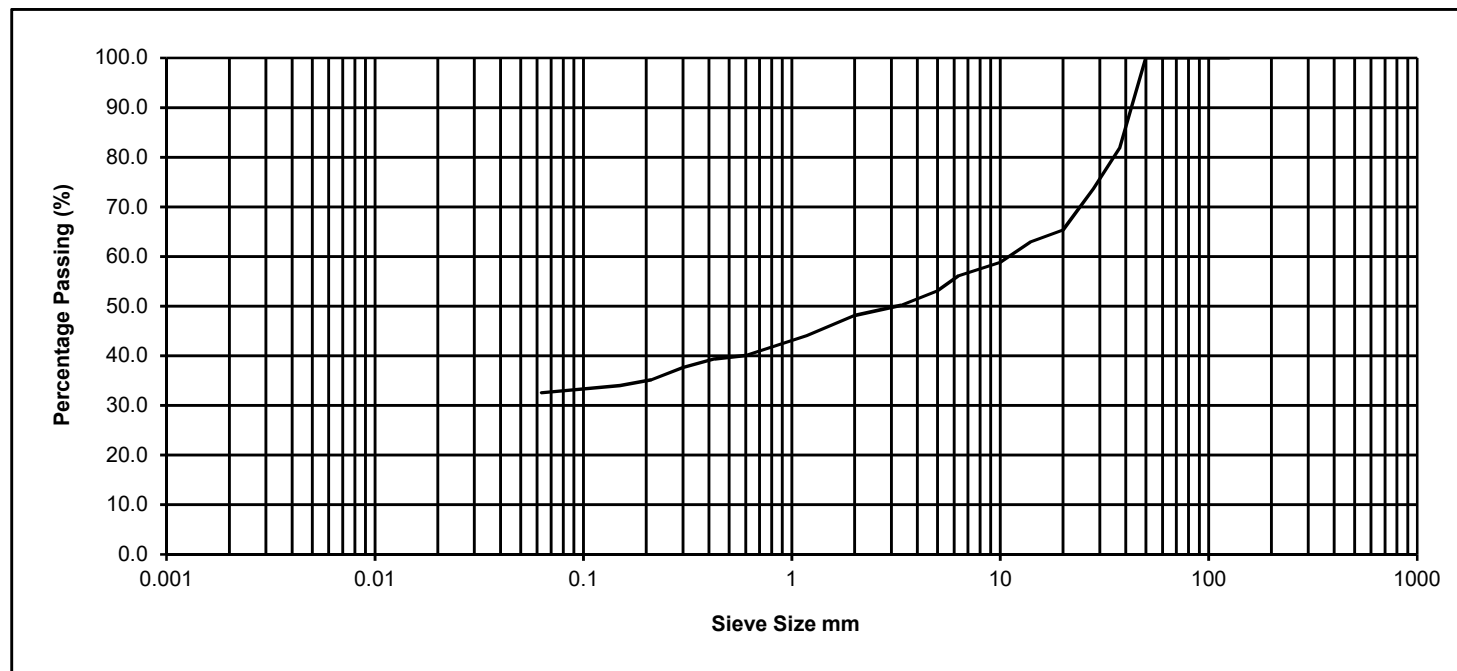
Project Limerick (Corcanree)

Sample No.

Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	4.5m
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[illegible]

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	32.6			15.6			51.9				
										0.0	0.0

Sample Description Silty sandy GRAVEL

Project No. 2099-21

BH/TP No. BH06CR

Sample No.

Project	Limerick (Corcanree)
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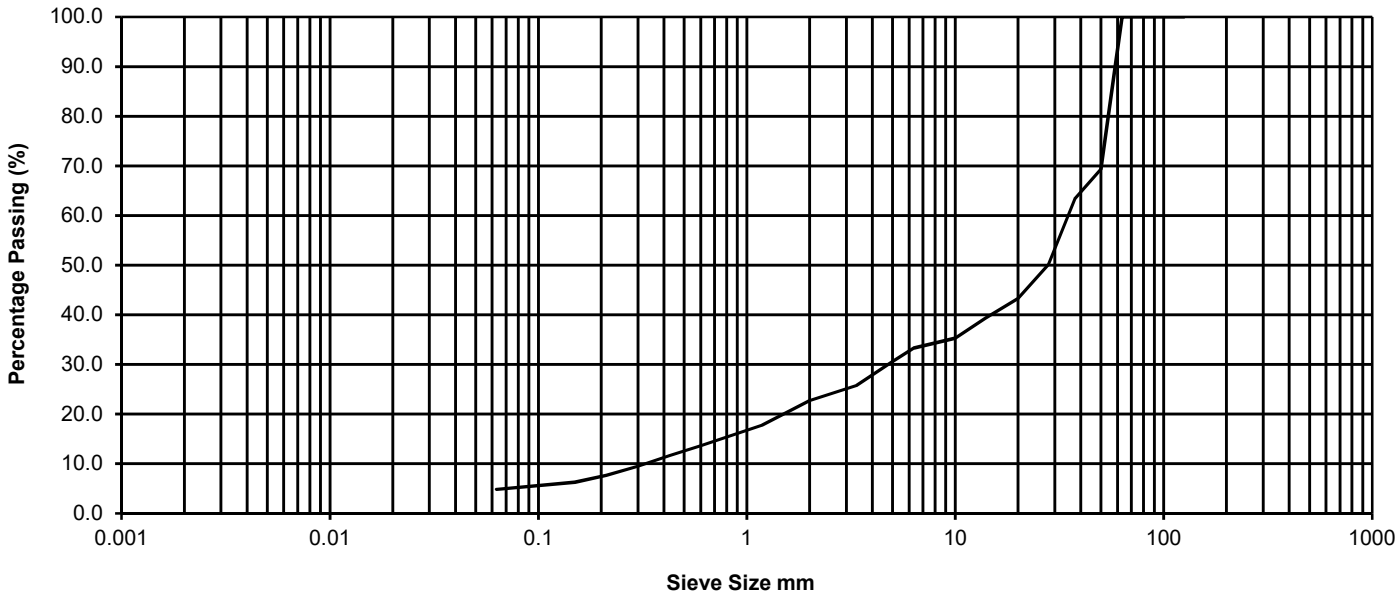
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	8.5m
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VINI Geotechnical Testing

Sieve	%
Size mm	Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	69.4
37.500	63.4
28.000	50.1
20.000	43.3
14.000	39.3
10.000	35.3
6.300	33.3
5.000	30.6
3.350	25.7
2.000	22.7
1.180	17.8
0.600	13.6
0.425	11.6
0.300	9.5
0.212	7.6
0.150	6.3
0.063	4.8

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	4.8			17.9			77.3				
										0.0	0.0

Sample Description Silty sandy GRAVEL

Project No. 2099-21

BH/TP No. BH06CR

Sample No.

Project	Limerick (Corcanree)
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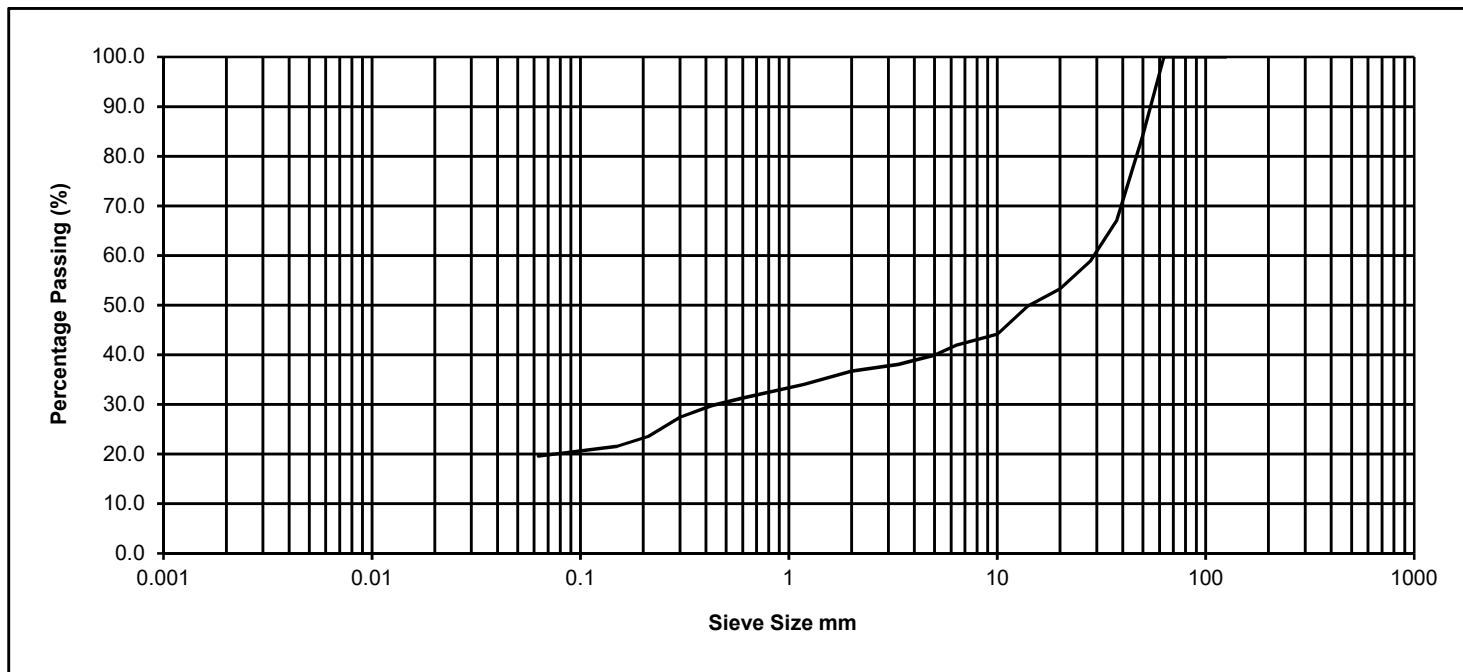
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	9.5m
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SS	Checked	VS	Approved	VS
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Date sample tested	10/08/2021	Depth	9.5m
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[illegible]

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size										Cobbles	Boulder
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	19.6			17.1			63.3			0.0	0.0

Sample Description Silty sandy GRAVEL

Project No. 2099-21

BH/TP No. TP01CR

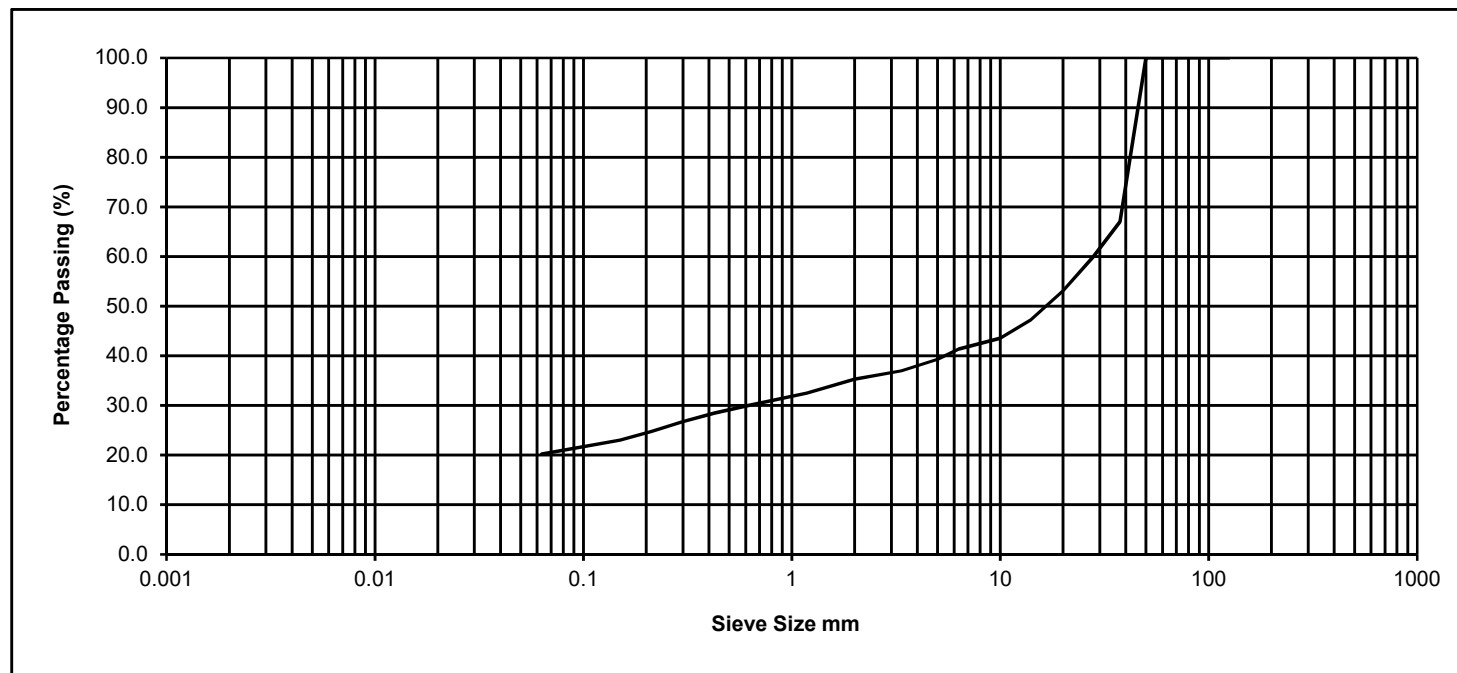
Sample No.

Project	Limerick (Corcanree)
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Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	2.0m
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[illegible]

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	20.2			15.1			64.7				
										0.0	0.0

Sample Description Silty sandy GRAVEL

Project No. 2099-21

BH/TP No. TP01CR

Sample No.

Project	Limerick (Corcanree)
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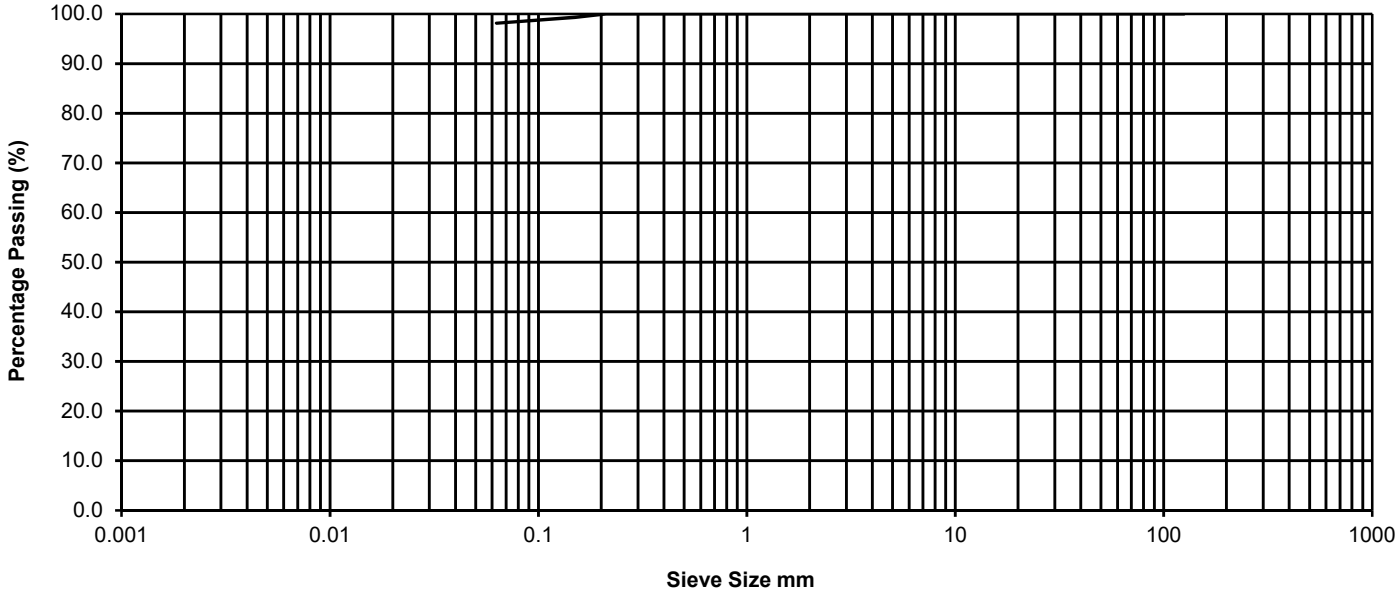
Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	4.0m
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VINI Geotechnical Testing

[illegible]

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	98.1			1.9			0.0				
										0.0	0.0

Sample Description Silty CLAY

Project No. 2099-21

BH/TP No. TP02CR

Sample No.

Project	Limerick (Corcanree)
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Operator	SS	Checked	VS	Approved	VS	Date sample tested	10/08/2021	Depth	3.0m
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DETS

Certificate of Analysis

Certificate Number 21-16299

Issued: 09-Aug-21

Client Whiteford
Straid House
2 Main Street
Straid
Ballyclare
BT39 9NE

Our Reference 21-16299

Client Reference 2099-21

Order No (not supplied)

Contract Title Limerick WWT Si

Description 27 Soil samples.

Date Received 03-Aug-21

Date Started 03-Aug-21

Date Completed 09-Aug-21

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

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

Approved By



Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-16299

Client Ref 2099-21

Contract Title Limerick WWT Si

Lab No	1884964	1884965	1884966	1884967	1884968	1884969	1884970	1884971	1884972
Sample ID	BH01BL	BH02BL	BH02BL	BH03BL	BH03BL	BH04BL	BH04BL	BH04BL	BH04BL
Depth	2.00	1.00	3.00	1.00	3.00	2.00	3.00	5.00	7.00
Other ID									
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units									
Inorganics												
pH	DETSC 2008#		pH	5.4		4.3		7.1	7.4		7.6	
Organic matter	DETSC 2002#	0.1	%	6.3	6.3		2.3	4.2		5.3	5.0	5.6
Sulphate as SO ₄ , Total	DETSC 2321#	0.01	%	0.76	0.61			0.37	0.17		0.26	

Summary of Chemical Analysis

Soil Samples

Our Ref 21-16299

Client Ref 2099-21

Contract Title Limerick WWT Si

Lab No	1884973	1884974	1884975	1884976	1884977	1884978	1884979	1884980	1884981	1884982	1884983	1884984
Sample ID	BH05BL	BH05BL	BH05BL	BH06BL	BH06BL	BH06BL	BH01CR	BH01CR	BH02CR	BH02CR	BH03ACR	BH04CR
Depth	3.50	6.50	7.50	1.00	8.20	9.20	2.00	4.00	4.00	5.00	4.00	5.50
Other ID												
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units											
Inorganics														
pH	DETSC 2008#		pH	6.9			7.9			8.2	7.3	8.0	7.8	7.8
Organic matter	DETSC 2002#	0.1	%		4.6	8.3		4.6	2.3		3.6		3.6	4.6
Sulphate as SO ₄ , Total	DETSC 2321#	0.01	%	0.64			0.27			0.09	0.11	0.13	0.13	0.12

Summary of Chemical Analysis

Soil Samples

Our Ref 21-16299

Client Ref 2099-21

Contract Title Limerick WWT Si

Lab No	1884985	1884986	1884987	1884988	1884989	1884990
Sample ID	BH05CR	BH06CR	BH06CR	BH06CR	BH06CR	TP01CR
Depth	1.00	1.50	2.50	4.50	6.50	2.00
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Inorganics									
pH	DETSC 2008#		pH	7.9	8.4	7.9			7.8
Organic matter	DETSC 2002#	0.1	%			3.0	7.1	10	
Sulphate as SO ₄ , Total	DETSC 2321#	0.01	%	0.16	0.06	0.14			0.08

Information in Support of the Analytical Results

Our Ref 21-16299
 Client Ref 2099-21
 Contract Limerick WWT Si

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1884964	BH01BL 2.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), Organic Matter (Manual) (28 days), pH + Conductivity (7 days)	
1884965	BH02BL 1.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), Organic Matter (Manual) (28 days)	
1884966	BH02BL 3.00 SOIL		PT 500ml	Sample date not supplied, pH + Conductivity (7 days)	
1884967	BH03BL 1.00 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884968	BH03BL 3.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), Organic Matter (Manual) (28 days), pH + Conductivity (7 days)	
1884969	BH04BL 2.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1884970	BH04BL 3.00 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884971	BH04BL 5.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), Organic Matter (Manual) (28 days), pH + Conductivity (7 days)	
1884972	BH04BL 7.00 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884973	BH05BL 3.50 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1884974	BH05BL 6.50 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884975	BH05BL 7.50 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884976	BH06BL 1.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1884977	BH06BL 8.20 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884978	BH06BL 9.20 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884979	BH01CR 2.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1884980	BH01CR 4.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), Organic Matter (Manual) (28 days), pH + Conductivity (7 days)	
1884981	BH02CR 4.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1884982	BH02CR 5.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), Organic Matter (Manual) (28 days), pH + Conductivity (7 days)	
1884983	BH03ACR 4.00 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884984	BH04CR 5.50 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1884985	BH05CR 1.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1884986	BH06CR 1.50 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), pH + Conductivity (7 days)	

Information in Support of the Analytical Results

Our Ref 21-16299
Client Ref 2099-21
Contract Limerick WWT Si

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1884987	BH06CR 2.50 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), Organic Matter (Manual) (28 days), pH + Conductivity (7 days)	
1884988	BH06CR 4.50 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884989	BH06CR 6.50 SOIL		PT 500ml	Sample date not supplied, Organic Matter (Manual) (28 days)	
1884990	TP01CR 2.00 SOIL		PT 500ml	Sample date not supplied, Total Sulphate ICP (30 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

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

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

QUB Geotechnical Testing Laboratory

Client	WF
Job Ref	2099-21
Date	10/08/2021
Borehole number	BH01CR
Sample number	
Depth m	4.5m
Soil type	Silty CLAY
Test	1 D Consolidation

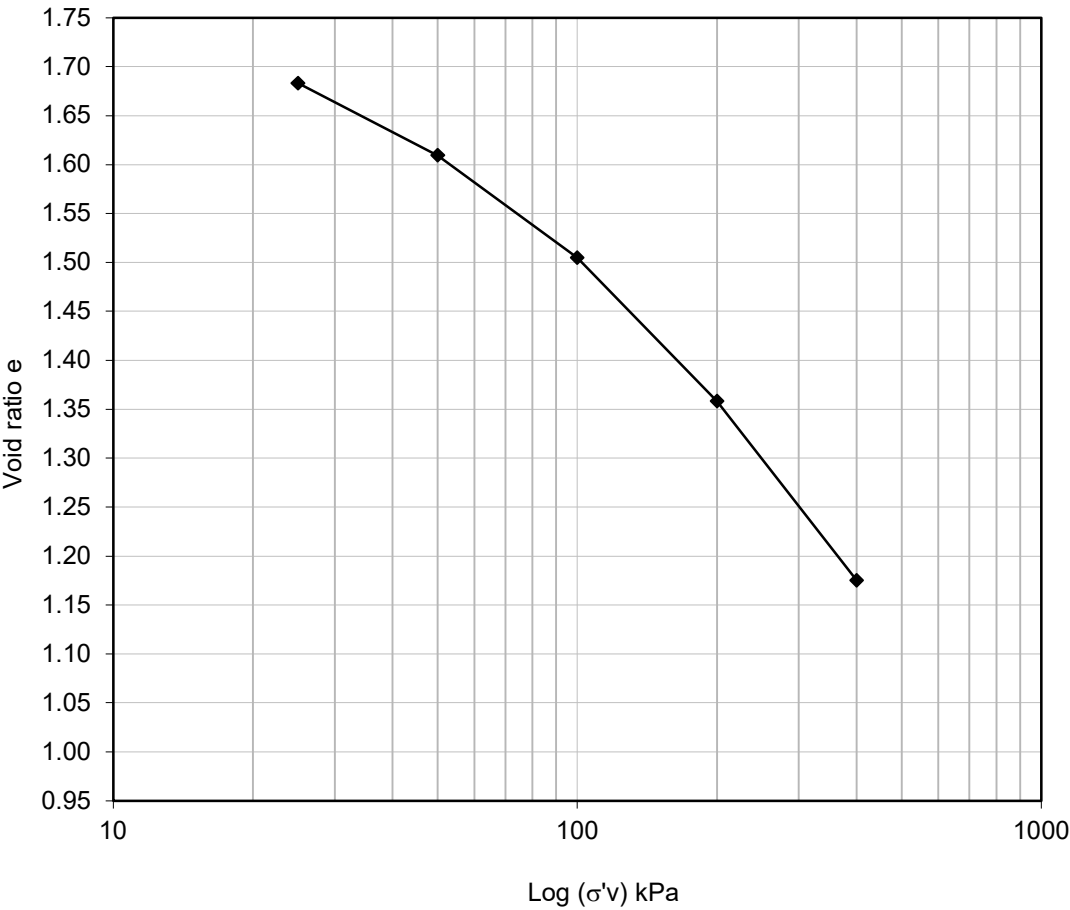
Remoulded sample

Ring Diameter mm	74.9
Ring Height mm	20.1
Initial Vol m3	8.8518E-05

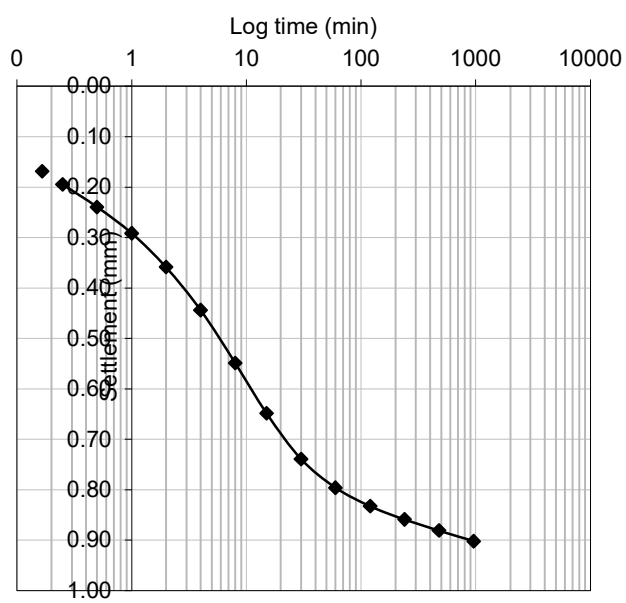
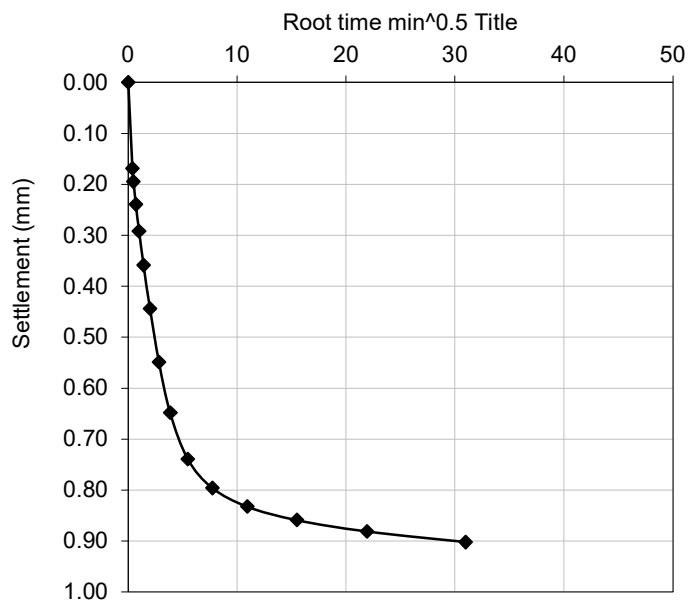
Wet mass (i) g	142.3
Wet mass (f) g	126.3
Dry mass g	83.5
Water content (i) %	70.4
Water content (f) %	51.3
Bulk density kg/m3	1607.6
Dry density kg/m3	943.3

Diameter mm	74.9		
Initial Height mm	20.1	Specific gravity	2.65

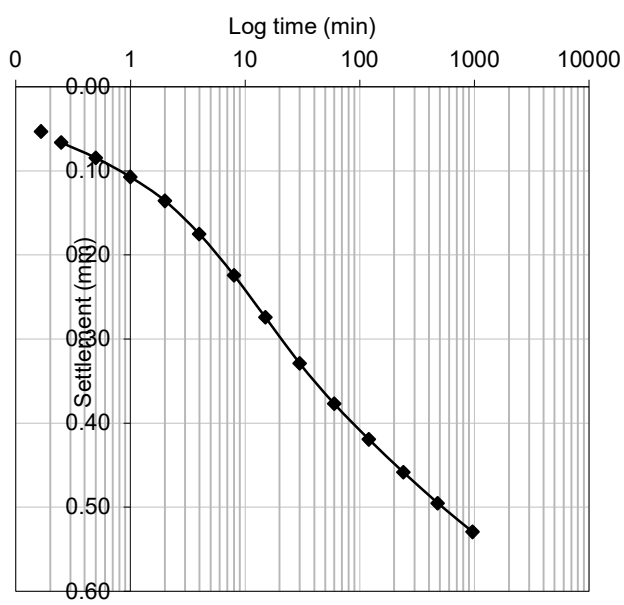
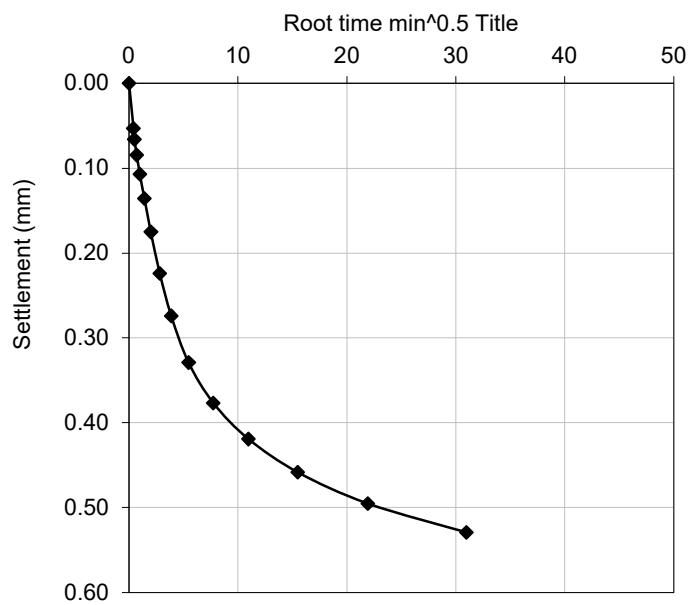
σ'_v kPa	ΔH mm	H mm	V cm3	Vv cm3	e	log(σ'_v)	Compressibility m2/MN	Cv m2/year
25	0.902	19.198	84.545	53.036	1.683	1.40		
50	0.529	18.669	82.215	50.706	1.609	1.70	1.10	0.48
100	0.748	17.921	78.921	47.411	1.505	2.00	0.80	0.44
200	1.048	16.873	74.305	42.796	1.358	2.30	0.58	0.39
400	1.310	15.563	68.536	37.026	1.175	2.60	0.39	0.33



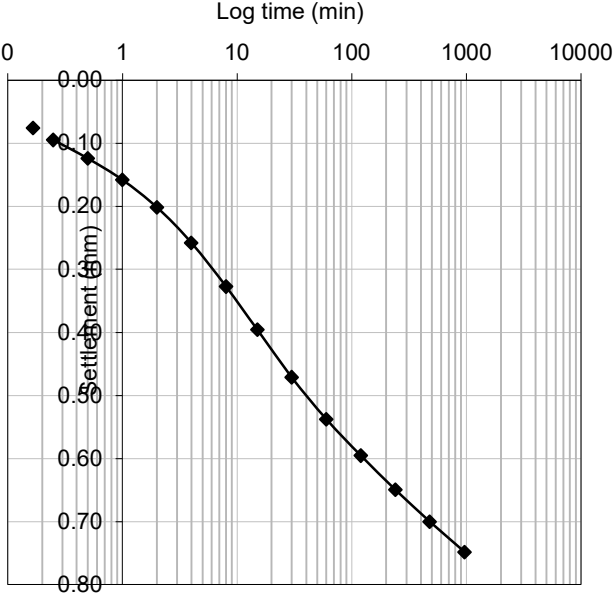
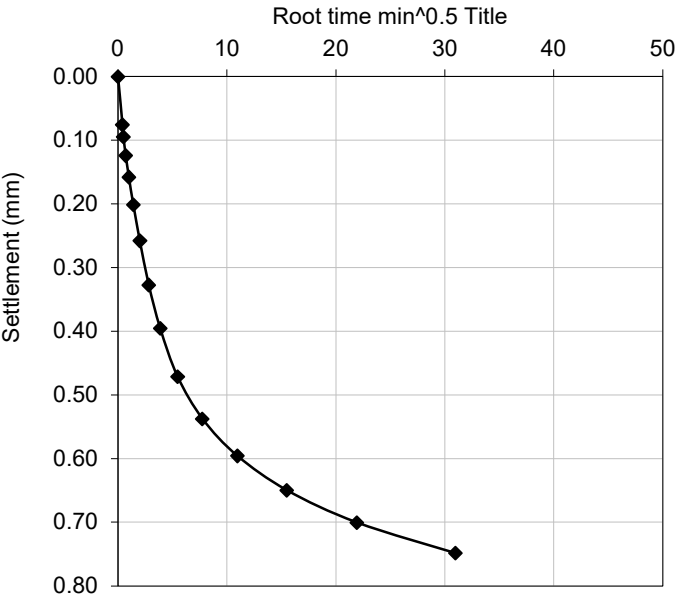
25kPa



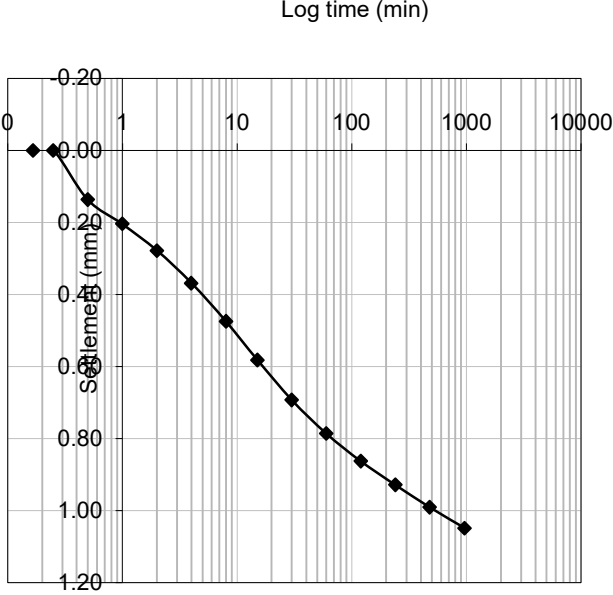
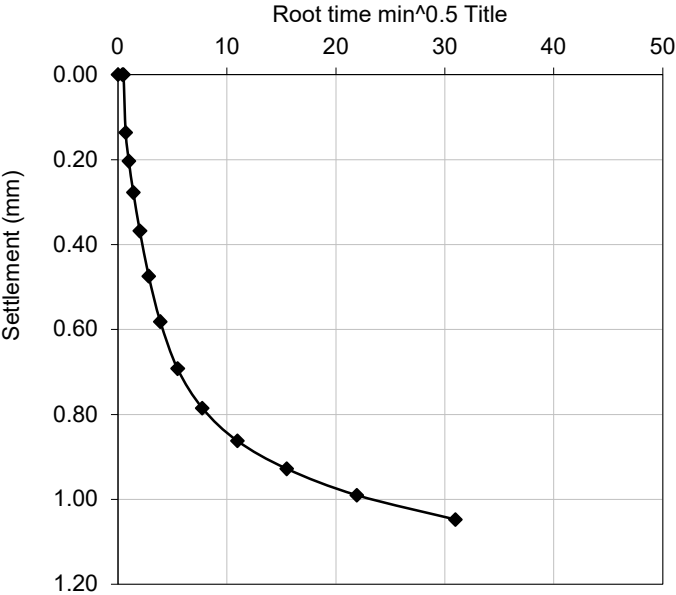
50kPa



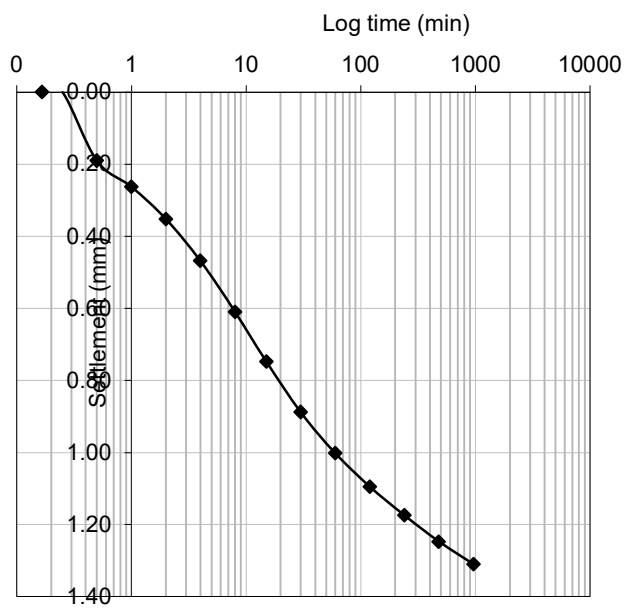
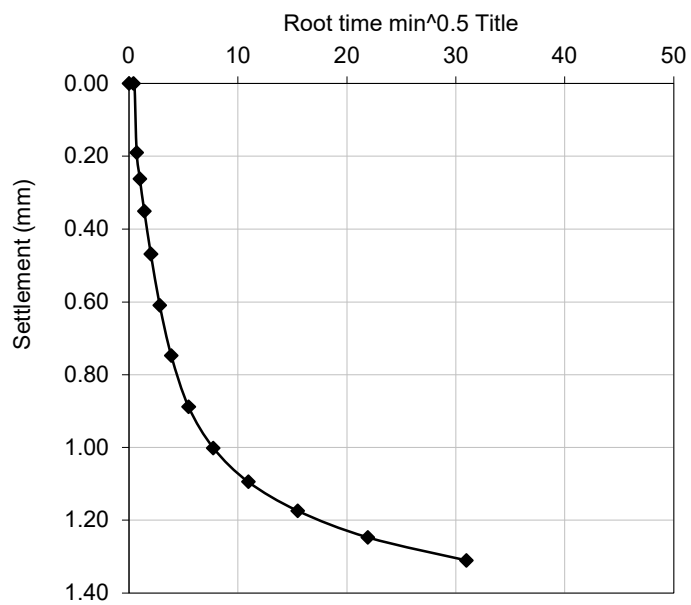
100kPa



200kPa



400kPa



QUB Geotechnical Testing Laboratory

Client	WF
Job Ref	2099-21
Date	10/08/2021
Borehole number	BH03CR
Sample number	
Depth m	4.5m
Soil type	Silty CLAY
Test	1 D Consolidation

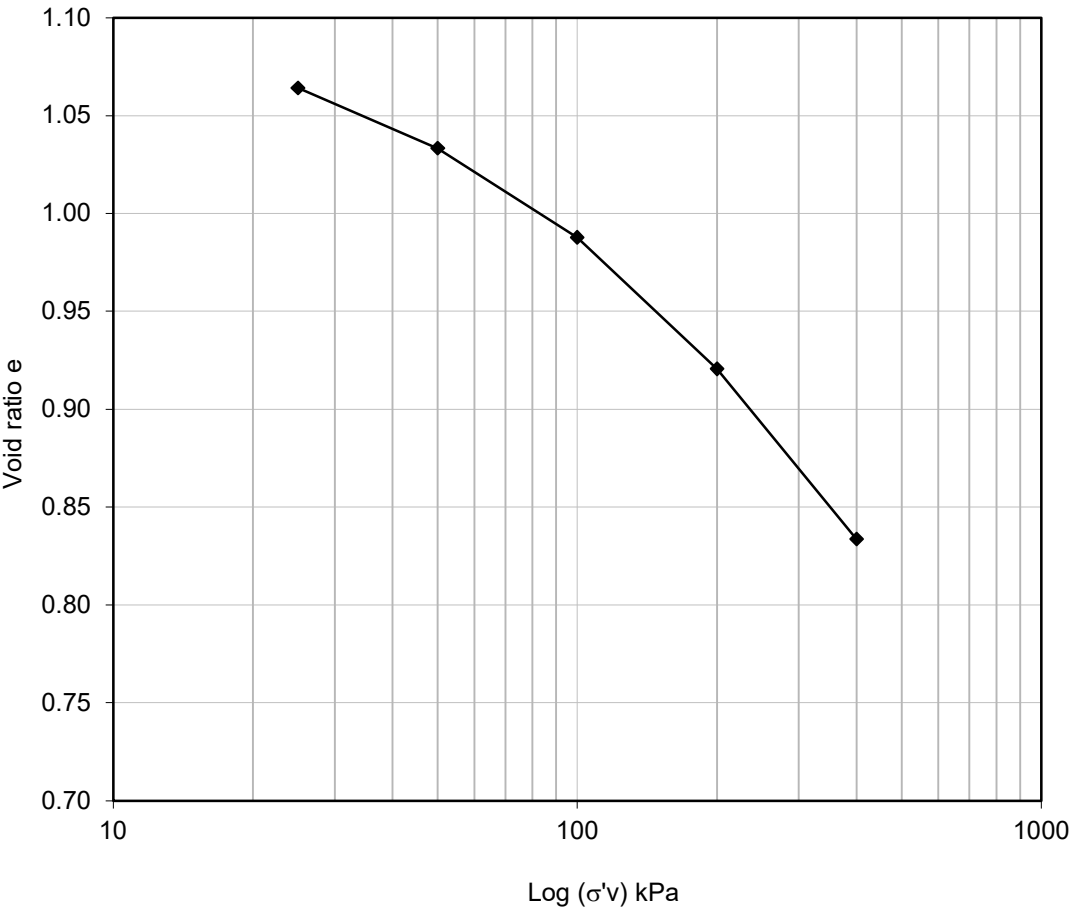
Remoulded sample

Ring Diameter mm	75.0
Ring Height mm	19.2
Initial Vol m3	0.00008478

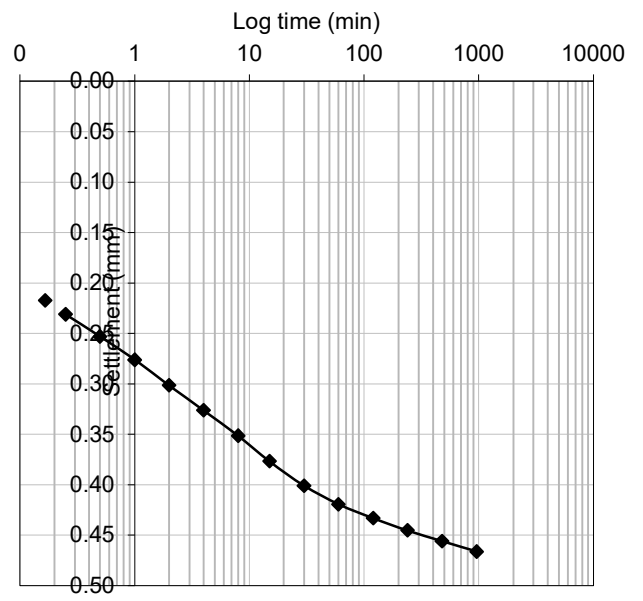
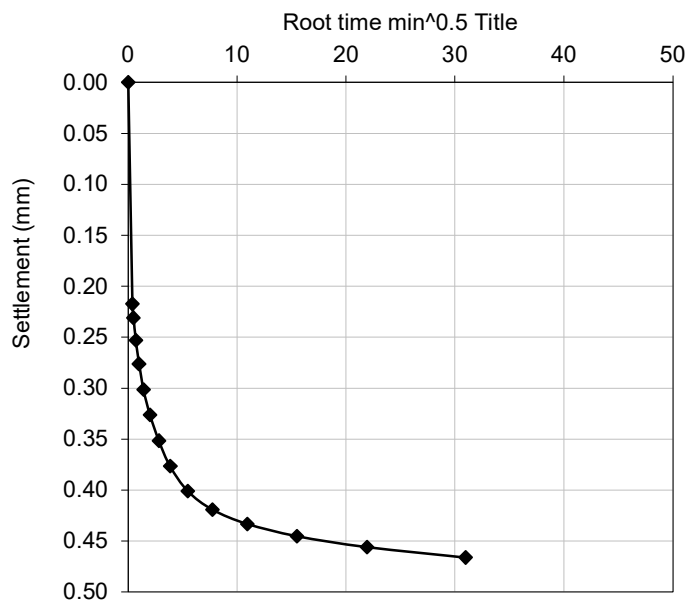
Wet mass (i) g	148.9
Wet mass (f) g	142.5
Dry mass g	106.2
Water content (i) %	40.2
Water content (f) %	34.2
Bulk density kg/m3	1756.3
Dry density kg/m3	1252.7

Diameter mm	75.0		
Initial Height mm	19.2	Specific gravity	2.65

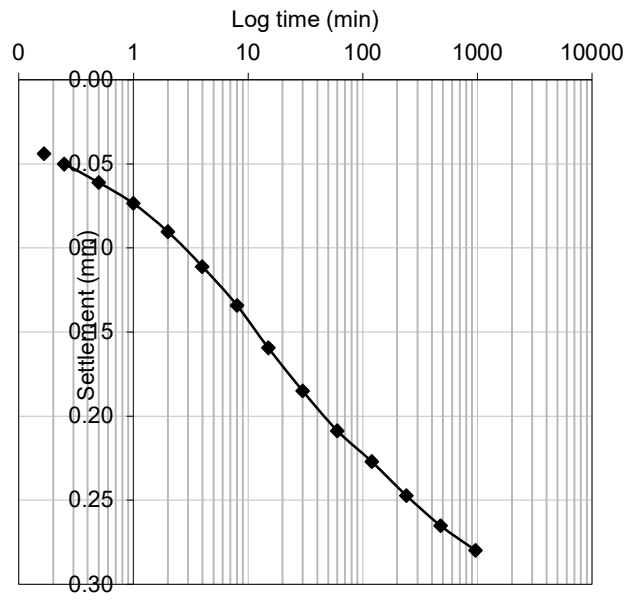
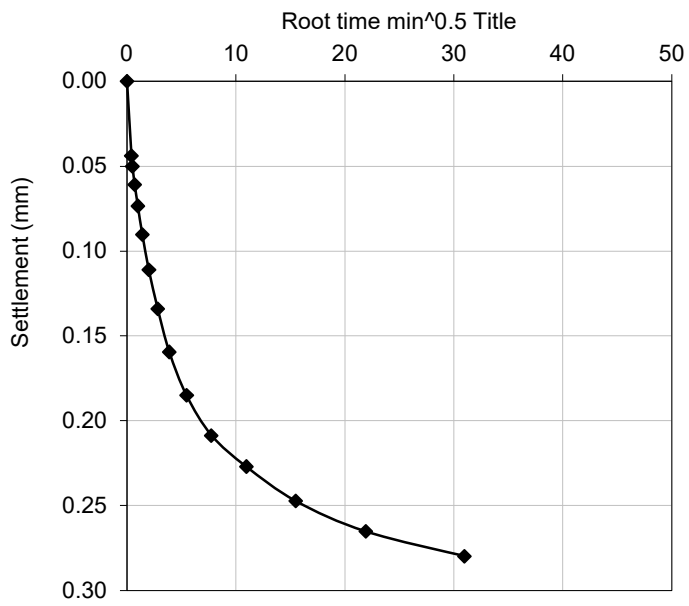
σ'_v kPa	ΔH mm	H mm	V cm3	Vv cm3	e	log(σ'_v)	Compressibility m2/MN	Cv m2/year
25	0.466	18.734	82.721	42.646	1.064	1.40		
50	0.280	18.454	81.486	41.411	1.033	1.70	0.60	0.47
100	0.414	18.040	79.658	39.582	0.988	2.00	0.45	0.45
200	0.609	17.431	76.970	36.894	0.921	2.30	0.34	0.42
400	0.791	16.641	73.479	33.403	0.834	2.60	0.23	0.38



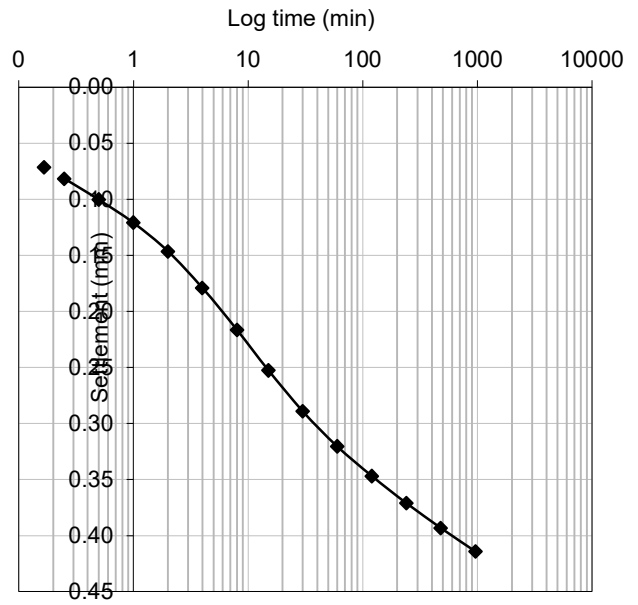
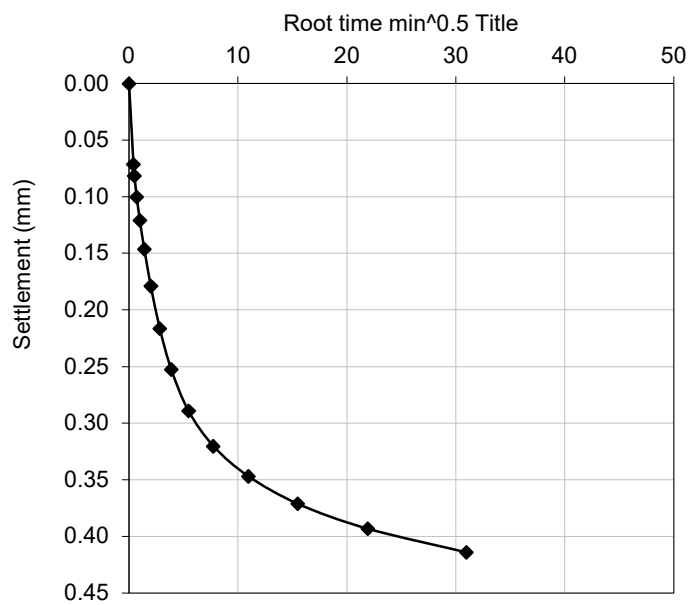
25kPa



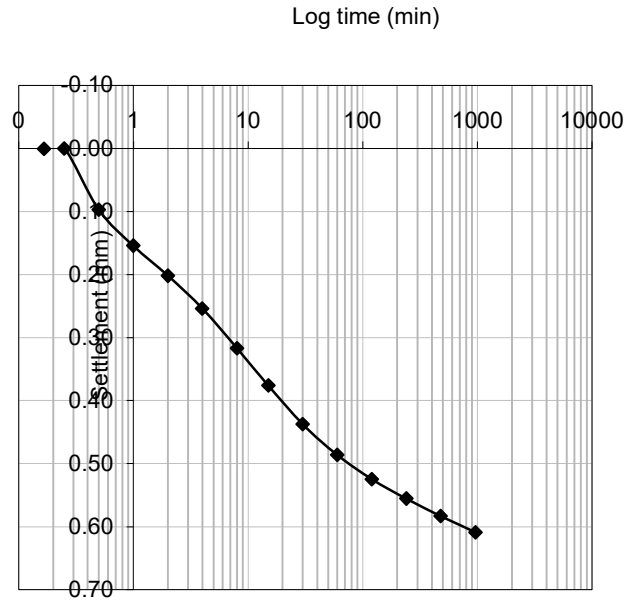
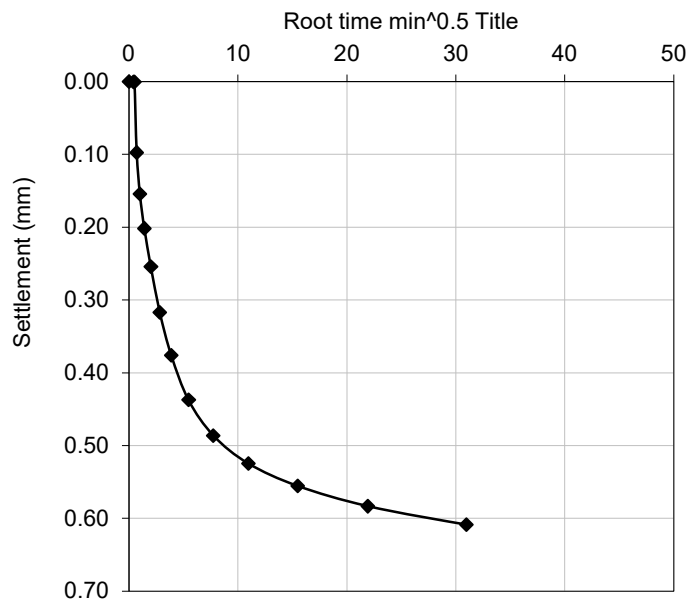
50kPa



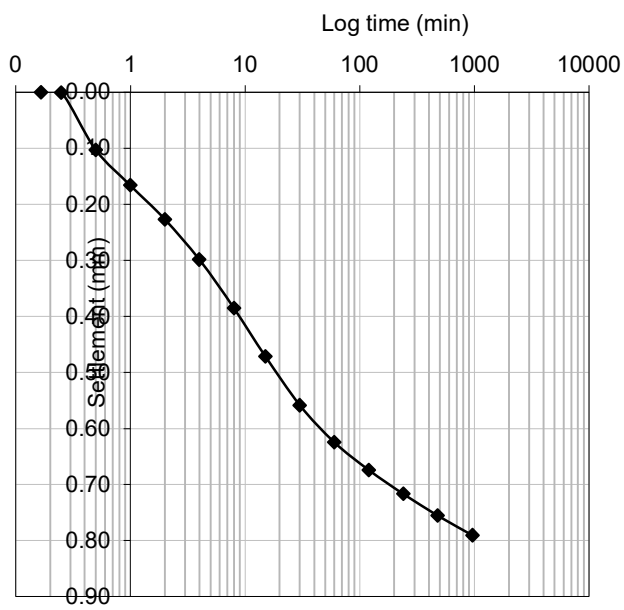
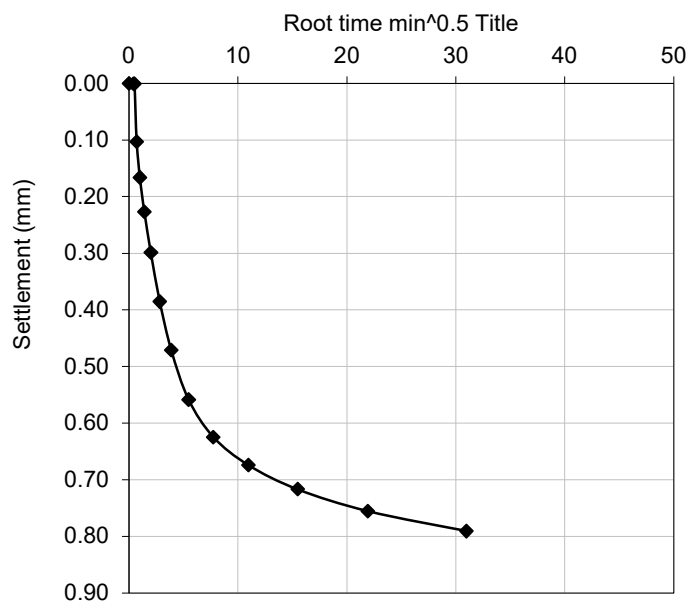
100kPa



200kPa



400kPa



Point Load Testing



Location: Corcanree PS

Project No: 2099-21

Sample no:	Postion	Sample Depth (m)	Diameter (mm) "D"	Max Load (kN) "P"	Point Load Strength (Mpa) " I_s "	Size Correction Factor (F)	Corrected Point Load Strength (MPa) " $I_{s(50)}$ "
RC01CR	D	16.30	63	17.775	4.48	1.11	4.97
RC01CR	A	16.30	63	24.718	6.23	1.11	6.91
RC01CR	D	17.60	63	20.211	5.09	1.11	5.65
RC01CR	A	17.60	63	13.983	3.52	1.11	3.91
RC01CR	D	12.10	63	15.829	3.99	1.11	4.43
RC01CR	A	12.10	63	11.765	2.96	1.11	3.29
RC01CR	D	8.80	63	20.651	5.20	1.11	5.77
RC01CR	A	8.80	63	21.573	5.44	1.11	6.03
RC01CR	D	22.80	63	18.84	4.75	1.11	5.27
RC01CR	A	22.80	63	5.057	1.27	1.11	1.41
RC02CR	D	17.00	63	20.014	5.04	1.11	5.60
RC02CR	A	17.00	63	14.816	3.73	1.11	4.14
RC02CR	D	14.60	63	13.149	3.31	1.11	3.68
RC02CR	A	14.60	63	10.43	2.63	1.11	2.92
RC02CR	D	9.90	63	22.062	5.56	1.11	6.17
RC02CR	A	9.90	63	16.808	4.23	1.11	4.70
RC03CR	D	10.40	63	17.211	4.34	1.11	4.81
RC03CR	A	10.40	63	23.454	5.91	1.11	6.56
RC03CR	D	21.90	63	21.38	5.39	1.11	5.98
RC03CR	A	21.90	63	21.315	5.37	1.11	5.96
RC03CR	D	14.90	63	18.71	4.71	1.11	5.23
RC03CR	A	14.90	63	12.61	3.18	1.11	3.53
RC03CR	D	8.40	63	22.463	5.66	1.11	6.28
RC03CR	A	8.40	63	18.611	4.69	1.11	5.20

Point Load Testing



Location: Corcanree PS

Project No: 2099-21

Sample no:	Postion	Sample Depth (m)	Diameter (mm) "D"	Max Load (kN) "P"	Point Load Strength (Mpa) "I _s "	Size Correction Factor (F)	Corrected Point Load Strength (MPa) "I _{s(50)} "
RC04CR	D	16.40	63	34.631	8.73	1.11	9.68
RC04CR	A	16.40	63	22.87	5.76	1.11	6.39
RC04CR	D	13.50	63	22.448	5.66	1.11	6.28
RC04CR	A	13.50	63	16.158	4.07	1.11	4.52
RC04CR	D	8.80	63	21.843	5.50	1.11	6.11
RC04CR	A	8.80	63	21.335	5.38	1.11	5.96
RC04CR	D	19.20	63	21.691	5.47	1.11	6.06
RC04CR	A	19.20	63	19.002	4.79	1.11	5.31
					Operator	Checked	Approved
					DR	JMCN	JW

AS TM D5731-08

COMPRESSIVE STRENGTH OF ROCK CORE SPECIMENS

Client: Whiteford Geoservices Ltd
Project: Corcanree, Limerick

UCS1859
12-Nov-21

Page 1 of 1

Reports sent to: Whiteford Geoservices Ltd
Straid House
2 Main Street
Straid
Co Antrim BT39 9NE

joy.mcneill@whitefordgeoservices.com

Lab Core ID	R2647	R2648	R2649	R2650	R2651	R2652
Core Markings	RC01 8.3m	RC01 11.1m	RC01 14.6m	RC01 19.0m	RC02 8.3m	RC02 10.1m
Date of coring	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Date received	05-Oct-21	05-Oct-21	05-Oct-21	05-Oct-21	05-Oct-21	05-Oct-21
Diameter of core (Average mm)	63.4	63.4	63.3	63.4	63.4	63.4
Length at test (mm)	177.5	178.7	179.1	178.0	129.1	167.1
Length / Diameter Ratio	2.80	2.82	2.83	2.81	2.04	2.64
Mass (g)	1509	1528	1525	1540	1105	1419
Density (Mg/m ³)	2.69	2.71	2.70	2.74	2.71	2.69
Date of test	12-Nov-21	12-Nov-21	12-Nov-21	12-Nov-21	12-Nov-21	12-Nov-21
Fail Load (KN)	252.6	118.3	139.4	80.2	261.8	87.9
Measured compressive strength (MPa)	80.0	37.5	44.3	25.4	82.9	27.8
Failure Type	Axial splitting	Axial splitting	Axial splitting	Axial splitting	Axial splitting	Axial Splitting

Comments					Low L/D Ratio	
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Cores tested in received moisture condition using our UKAS calibrated Class 1 Compression Testing Machine.

Signed: I Nichol
I Nichol BSc(Hons) MSc

COMPRESSIVE STRENGTH OF ROCK CORE SPECIMENS

Client: Whiteford Geoservices Ltd
Project: Corcanree, Limerick

UCS1860
12-Nov-21

Page 1 of 1

Reports sent to: Whiteford Geoservices Ltd
Straid House
2 Main Street
Straid
Co Antrim BT39 9NE

joy.mcneill@whitefordgeoservices.com

Lab Core ID	R2653	R2654	R2655	R2656	R2657	R2658
Core Markings	RC02 14.3m	RC02 18.4m	RC03 9.0m	RC03 11.9m	RC03 17.9m	RC04 8.3m
Date of coring	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Date received	05-Oct-21	05-Oct-21	05-Oct-21	05-Oct-21	05-Oct-21	05-Oct-21
Diameter of core (Average mm)	63.4	63.4	63.3	63.3	63.3	63.3
Length at test (mm)	178.9	178.1	156.3	177.4	177.8	140.4
Length / Diameter Ratio	2.82	2.81	2.47	2.80	2.81	2.22
Mass (g)	1522	1512	1340	1513	1504	1192
Density (Mg/m ³)	2.69	2.69	2.72	2.71	2.69	2.69
Date of test	12-Nov-21	12-Nov-21	12-Nov-21	12-Nov-21	12-Nov-21	12-Nov-21
Fail Load (KN)	164.4	200.7	52.6	134.7	193.6	200.6
Measured compressive strength (MPa)	52.1	63.5	16.7	42.8	61.5	63.7
Failure Type	Axial splitting	Axial splitting	Axial splitting along incipient fracture	Axial splitting	Axial splitting	Axial Splitting

Comments						Low L/D Ratio
----------	--	--	--	--	--	---------------

Cores tested in received moisture condition using our UKAS calibrated Class 1 Compression Testing Machine.

Signed: I Nichol
I Nichol BSc(Hons) MSc

COMPRESSIVE STRENGTH OF ROCK CORE SPECIMENS

Client: Whiteford Geoservices Ltd
Project: Corcanree, Limerick

UCS1861
12-Nov-21

Page 1 of 1

Reports sent to: Whiteford Geoservices Ltd
Straid House
2 Main Street
Straid
Co Antrim BT39 9NE

joy.mcneill@whitefordgeoservices.com

Lab Core ID	R2659	R2660				
Core Markings	RC04 10.5m	RC04 22.1m				
Date of coring	Unknown	Unknown				
Date received	05-Oct-21	05-Oct-21				
Diameter of core (Average mm)	63.3	63.4				
Length at test (mm)	177.7	177.2				
Length / Diameter Ratio	2.81	2.80				
Mass (g)	1507	1516				
Density (Mg/m ³)	2.69	2.71				
Date of test	12-Nov-21	12-Nov-21				
Fail Load (KN)	161.8	269.4				
Measured compressive strength (MPa)	51.4	85.3				
Failure Type	Axial splitting	Axial splitting				

Comments						
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Cores tested in received moisture condition using our UKAS calibrated Class 1 Compression Testing Machine.

Signed: I Nichol
I Nichol BSc(Hons) MSc



Contract Number: 56315

Client Ref: **2099-21**

Report Date: **05-11-2021**

Client PO:

Client **Whiteford Geoservices Ltd**
Straid House
2 Main Street
Sreaid
Ballyclare
Co Antrim
Northern Ireland
BT39 9NE

Contract Title: **Limerick WWTP Upgrades**
For the attention of: **Joy McNeill**

Date Received: **19-10-2021**

Date Completed: **05-11-2021**

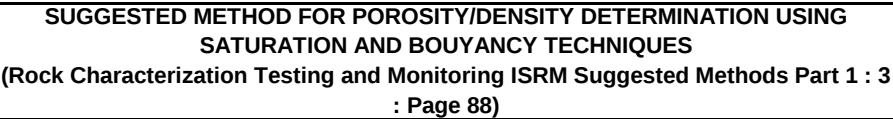
Test Description	Qty
Determination of the porosity and density using saturation and caliper techniques. ISRM Suggested Method For Determining Porosity/Density using saturation and caliper techniques - @ Non Accredited Test	2
Determination of the slake durability index, two cycles. ISRM Suggested Method For Determining Slake Durability - @ Non Accredited Test	2
Los Angeles Abrasion Value BS EN 1097-2 - * UKAS	1
Samples Received - @ Non Accredited Test	8
Crushing of sample for test	1
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

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 Signatories:

Emma Sharp (Business Support Manager) - Paul Evans (Director) - Richard John (Quality/Technical Manager)
Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager) - Wayne Honey (Quality Assistant / Administrator / Health and Safety Coordinator)



Contract Number	56315	
Site Name	Limerick WWTP Upgrades	
Test Details	Bulk volume was obtained by bouyancy techniques and pore volume obtained by saturation	
Date Tested	20/10/2021	

[illegible]

<u>Key</u>	<u>Reported As</u>
Moisture Content	%
Bulk Density	kg/m ³
Dry Density	kg/m ³
Bulk Volume	m ³
Porosity	%

Operators	Checked	04/11/2021	Emma Sharp	
JD	Approved	05/11/2021	Paul Evans	



Determination of Slake Durability Index
ISRM Part 2.2

Contract Number	56315	
Site Name	Limerick WWTP Upgrades	
Nature of Slaking Fluid	Water at 20°C	
Date Tested	20/10/2021	

Hole Reference	Depth (m)			Slake First Cycle	Slake Second Cycle	Appearance Of Material Retained In The Drum	Appearance Of Material Passing Through The Drum
RC01CR	8.50	-	10.10	99.58	99.35	10 Pieces of Subangular to well rounded rock core/ Aggregate material with some/ many/ all pieces with ground corners and edges	Sub-angular to well rounded <2mm fragments to a sand/ silt
RC03CR	10.10	-	11.60	99.53	99.30	10 Pieces of Subangular to well rounded rock core/ Aggregate material with some/ many/ all pieces with ground corners and edges	Sub-angular to well rounded <2mm fragments to a sand/ silt
		-					
		-					
		-					
		-					
		-					
		-					
		-					
		-					
		-					
		-					
		-					
		-					

Key

Reported As

Slake First Cycle	%
Slake Second Cycle	%

Operators	Checked	04/11/2021	Wayne Honey	<i>W. Honey</i>
KS	Approved	05/11/2021	Paul Evans	<i>P. Evans</i>



Contract Number	56315	
Site Name	Limerick WWTP Upgrades	
Sample Preparation		
Date Tested	20/10/2021	

[illegible][illegible]

Method of Sampling in accordance with
BS932-1 General Requirements and Sample
Preparation



Operators	Checked	04/11/2021	Emma Sharp	
Julian	Approved	05/11/2021	Paul Evans	

APPENDIX E PHOTOGRAPHS

TRIAL HOLE PHOTOGRAPHS

4 x A4

ROCK CORE PHOTOGRAPHS

24 x A4



TP-01CR



TP-01CR



TP-01CR



TP-01CR



TP-02CR



TP-02CR



TP-02CR



TP-02CR



RC01CR



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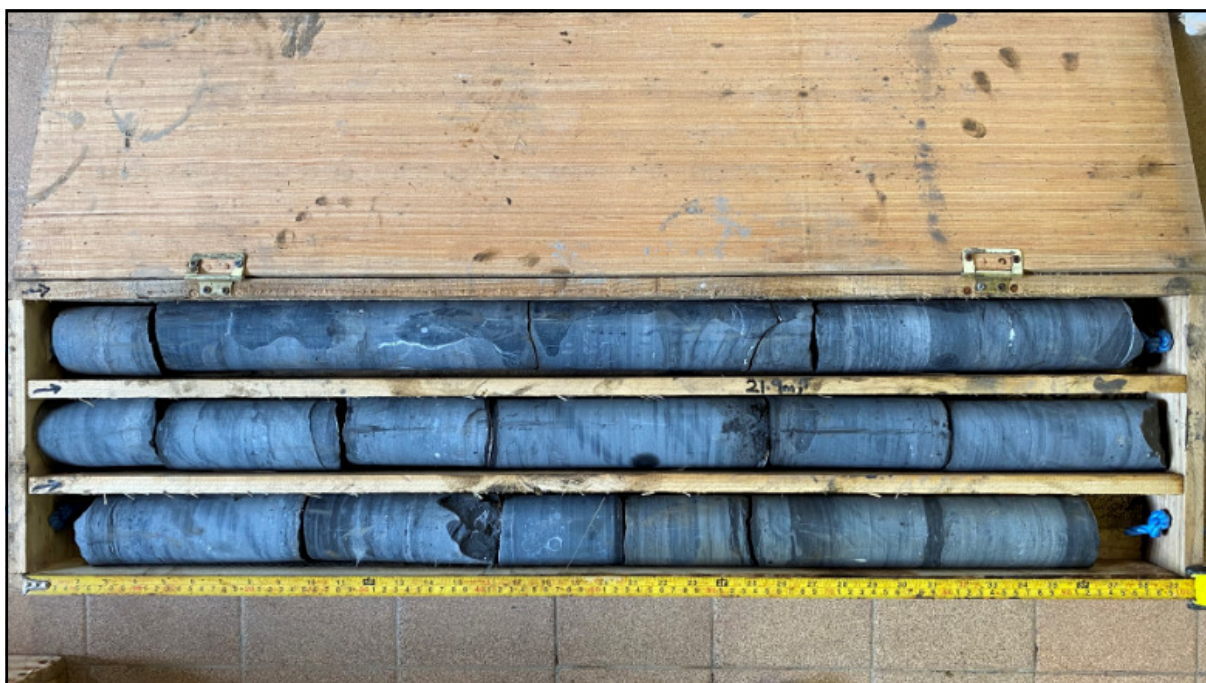
RC04CR



RC04CR



RC04CR



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Ireland

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