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GEOTECHNICAL REPORT

job number	C2623/24/E/6181	date	09.02.2024
site address	Land on Brendon Avenue, Moston, Manchester, Greater Manchester, M40 9DN		
written by	S. Hale	checked by	R. Palmer
issued by	S. Hale		



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Report on a Geotechnical Investigation

Location:	Brendon Avenue Moston, Manchester, Greater Manchester, M40 9DN		
For:	MKenny Properties Limited		
Report No.	C2623/24/6181	Report date:	February 2024

For and on behalf of **Rogers Geotechnical Services Ltd**

	
Steven Hale BSc FGS Geo-environmental Technician	Rob Palmer MSc FGS ACIEH Engineering Director

Report Summary¹

Item	Comments	Section
Development	Construction of 6no. new residential dwellings.	1.
Geology	Superficial geology – Till Solid geology – Pennine Middle Coal Measure Formation	4.
Strata Conditions	Thickness of made ground over clayey, silty, slightly gravelly SAND and sandy, slightly gravelly, silty CLAY representing superficial Till deposits. NHBC Class – Medium.	5. & 5.1
Groundwater	None recorded	5.2
Foundation Design	Shallow strip or spread foundations constructed within the natural deposits (minimum depth 1.0m bgl).	8.
Ground-floor	Suspended ground-floor slab	8.3
Hard-standing Design	Assumed CBR = 5%	8.4
Effect of Sulphates	ACEC Classification AC-1s, DS-1.	8.5

¹ This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.

1. Introduction

It is understood that the site is to be developed by the construction of 6no. new residential dwellings. Consequently, a site investigation has been undertaken in accordance with the instruction from MKenny Properties Limited. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of safe and economical foundations for the proposed development. This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue. It should be appreciated that this report only considers the geotechnical aspects of the site and not environmental or ground gas (carbon dioxide, methane or radon) issues.

3. Fieldworks

The fieldworks were undertaken on the 22nd January 2024 and included the following:

- One windowless sample borehole.
- One trial pit excavated with hand-held equipment.

The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report. It should be noted that it was not possible to access some areas of the site with the rig to carry out the remaining boreholes due to ongoing construction.

3.1 Windowless Sample Boreholes

The borehole was sunk using a drive-in windowless sampler. The cores were undertaken in 1m lengths and reduced in diameter from 87mm for the first 2m through to 77mm for the subsequent 1m increment. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils were described in general accordance with BS5930: 2015+A1: 2020, and full descriptions are given on the windowless sample records which are presented in Appendix 2. Also included on these records are the core diameters and percentages of core recovered.

3.2 Standard Penetration Tests

Standard penetration tests (SPT) were undertaken at regular depth increments within windowless sample borehole WS02. The SPT was conducted in accordance with the procedures given in BS EN ISO 22476: Part 3: 2005 +A1: 2011, and the results are summarised on the borehole record. During this work an automatic trip hammer of 63.5kg falling through 760mm was employed to drive either a cone or split barrel sampler assembly into the ground and the recovered barrel samples were retained in air tight plastic containers.

3.2 Hand Dug Trial Pit

One trial pit was excavated in order to identify the strata to an area of the site that could not be accessed via the windowless sampler. This trial pit was excavated using hand tools and logged in general accordance with BS5930: 2015 +A1: 2020, and full descriptions are given on the trial pit record which is presented in Appendix 3. The pit was then backfilled with the arisings.

4. Geology

The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: Geological Data for the Site			
Strata Type	Strata Name ²	Previous Name ³	Description ³
Superficial Geology	Till	Boulder Clay	It consists of a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape.
Solid Geology	Pennine Middle Coal Measures Formation	Middle Coal Measures Formation	Interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams, with a bed of mudstone containing marine fossils at the base, and several such marine fossil-bearing mudstones in the upper half of the unit.

5. Strata Conditions

In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile			
Depth m below ground level to underside of layer	Strata Type	Positions Layer Revealed	Groundwater Strikes m below ground level
0.28	MADE GROUND (Soft to firm, slightly sandy, gravelly, silty CLAY)	WS02	None
0.81 – 1.00	MADE GROUND (Soft to firm, slightly gravelly, silty CLAY)	All	None

² Sources: British Geological Survey (NERC) Map Sheets 85; Manchester; Solid and Drift Edition, and Geology of Britain Viewer [online resource from www.bgs.ac.uk]

³ Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [online resource from www.bgs.ac.uk]

1.48	TILL (Loose, clayey, silty SAND)	WS02	None
+1.20	TILL (Soft to firm, sandy, slightly gravelly, silty CLAY)	HDTP01	None
+3.45	TILL (Stiff to very stiff, slightly sandy, slightly gravelly, silty CLAY)	WS02	None

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

5.1 General Strata

A significant thickness of made ground was revealed at both the borehole and trial pit. This made ground was found to consist of sandy, gravelly, silty clay to depths of between 0.81m and 1.00m below ground level (begl). Underlying the made ground in WS02 was brown and grey, clayey, silty sand to a depth of 1.48m begl. It is considered that this sand is likely representative of the superficial till deposits indicated to underlie the site. Beneath the sand at WS02 and the made ground at HDTP01, sandy, gravelly, silty clay was discovered to termination depths of 3.45m and 1.20m begl respectively. This clay is also thought to be representative of the superficial till deposits.

5.2 Groundwater

No groundwater was observed during this investigation. However, it should be appreciated that the normal rate of boring does not permit the recording of an equilibrium water level for any one strike. Moreover, groundwater levels are subject to seasonal variation or changes on local drainage conditions.

6. Insitu Testing

6.1 Standard Penetration Tests

The standard penetration tests carried out in WS02 are summarised in the following table:

Table 3: Summary of Standard Penetration Tests				
Strata	Depth Range (m)	SPT 'N' (Blows/300mm)		Comments
		Granular soils	Cohesive soils	
Clayey, silty SAND	1.00 to 1.45	5	-	Results indicate soil is in a loose in-situ condition.
Sandy, gravelly, silty CLAY	2.00 to 2.45	-	26	Results indicate soil ranges from a stiff to very stiff in-situ condition.
	3.00 to 3.45	-	65	

6.2 Hand Shear Vane Tests

Hand shear vane tests were carried out during logging, the results are presented in the table below:

Table 4: Summary of Hand Shear Vane Tests				
Position	Strata	Depth (m)	Hand Shear Vane Blade Size	Shear Strength (kPa)
WS02	MADE GROUND (Slightly gravelly, silty CLAY)	0.48	19mm	91
		0.58		76
		0.70		82
		0.80		76
	TILL (Slightly sandy, slightly gravelly, silty CLAY)	1.75		44
		1.80		78
		1.86		141
		1.94		145
		2.38		110
		2.50		113
		2.69		172
		2.86		>197
		2.93		>197

7. Laboratory Testing - Geotechnical

The following programme of laboratory testing has been undertaken on samples obtained during this investigation:

- Determination of water content BS EN ISO 17892-1:2014
- Determination of liquid and plastic limits BS EN ISO 17892-12:2018
- Determination of particle size distribution (Dry) BS EN ISO 17892-4:2016: 5.2
- Sedimentation by pipette BS EN ISO 17892-4:2016: 5.3 – 5.4
- Soluble sulphate content BS 1377-3:2018+A1:2021: Pt3: 7.3
- pH value BS 1377-3:2018+A1:2021: Pt3: 12
- One-dimensional consolidation BS 1377-5:1990: Pt5: 3

The test results are presented in Appendix 4 and are summarised below:

Table 5: Summary of Geotechnical Test Results				
Test type	No. of Tests	Range of Results		Comments
Moisture content determinations	6	14% to 33%		Generally reducing with depth.
Index properties	5	LL PL PI	30 to 62% 15 to 29% 14 to 33%	Clay of high plasticity. Consistency index 0.9 to 1.2 NHBC Class - Medium
Particle size distribution (Dry sieve and sedimentation)	1	Gravel Sand Silt Clay	1% 72% 20% 7%	Clayey, silty, slightly gravelly, fine to coarse SAND Uniformity coefficient 56 Curvature coefficient 136
One-dimensional consolidation	1	c_v m_v	3.7 m ² /yr 0.11 m ² /MN	Relatively fast rate of settlement. Medium compressibility.
Soluble sulphate & pH	1	SO ₄ pH	0.08 g/l 7.05	

In cohesive soil the approximate cohesion, c_u , and coefficient of consolidation, m_v , may be obtained from the equivalent SPT 'N' value using the following expressions (Stroud 1975).

$$c_u = f_1 N \quad \text{where:} \quad c = \text{cohesion (kN/m}^2\text{).}$$

$$m_v = \frac{1}{f_2 N} \quad m_v = \text{Coefficient of consolidation (m}^2\text{/MN)}$$

f_1 & f_2 = factors based on plasticity index
 N = SPT 'N₃₀₀' value.

For the cohesive soils revealed at this site the highest (worst case) plasticity index⁴ of 33% could be employed, which suggests an f_1 value of 4.3 and a f_2 value of 0.44.

7.1 Geotechnical Properties

The idealised geotechnical properties employed in design are summarised below.

Table 6: Summary of Geotechnical Properties			
Property	Range of values		Comments
Volume change potential (NHBC)	Medium		Slightly sandy, slightly gravelly, silty CLAY
Shear strength parameters (at proposed foundation level)	c _u	21.5 kN/m ²	Stroud (1974) where c _u = f ₁ N assuming N value of 5 at 1.0m
Consolidation characteristics	c _v m _v	3.7 m ² /yr 0.11 m ² /MN	
Consolidation characteristics	m _v	2.2 m ² /MN	Stroud (1974) where m _v = 1/f ₂ N assuming an N value of 5 at 1.0m
Concrete classification	DC1		Natural ground locations (Static water)

8. Discussion of Ground Conditions - Geotechnical

It is understood that this site is to be developed by the construction of 6no. new residential dwellings. It should be appreciated that at the time of writing this report, the buildings are partially built, with footings already installed. It is understood that the foundations for this development comprise strip footings and have been placed at depths of between 1.0m and 1.2m depth.

8.1 Foundations

The results of this investigation indicate that made ground will be revealed to depths of 1.0m. It should be appreciated that the foundations for this site have already been placed at 1.0m to 1.2m depth and thus below the made ground. Strip foundations constructed at this depth will be discussed below.

Previous investigation at the site generally revealed firm and stiff clays at 1.0m depth (see soakaway report C2623/23/E/5398). However, within the recent investigation, a discrete layer of sand was revealed at 1.0m depth (WS02). Nonetheless, stiff clay was then revealed at approximately 1.5m depth. Given the presence of sand at WS02, and to account for a worst-case scenario, the following bearing pressures assume that all foundations have been placed on sand,

⁴ See paragraph 6.2 'Index Property Tests'

although in reality this is unlikely to be the case. In doing this, the allowable increase in stress shall be lower than if assuming all foundations were on clay.

Table 7: Allowable Increase in Stress

Foundation Type		Strip Footings		
Foundation Breadth	B (m)	0.6	0.9	1.2
Foundation Depth	D (m)	1.0		
Allowable Increase in Stress	(kN/m ²)	25	40	40
Ultimate Increase in Stress	(kN/m ²)	75	120	120
Ultimate Bearing Capacity ⁵	(kN/m ²)	95	140	140

The allowable increase in stress given above assumes an SPT 'N' value at 1.0m depth, as recorded in WS02, with a factor of safety of 3 applied. The ultimate increase in stress of the soil is assumed to be 75kN/m² at foundation depth. The ultimate bearing capacity may be adopted for foundation design. Whilst this value suggests that the foundations are unlikely to fail in shear, this value does not have a factor of safety applied which is typically needed to account for settlement.

Therefore, a settlement calculation for the sands was undertaken which estimates that they will settle approximately 5mm. It should be noted that the settlement of the sands are expected to occur relatively quickly, likely during the construction phase. In regards to the cohesive soils beneath the sands, it is expected that any settlement will be within tolerable limits due to their stiff in-situ condition.

Should seepages of groundwater be encountered it is considered that they could be dealt with using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped.

The stability of the excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In this method the foundation trenches should be excavated, inspected and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations.

8.2 Volume Change Potential

It should be appreciated that the cohesive soils revealed at this site possess a medium volume change potential under the guidance of the NHBC standards. Therefore, it will be necessary to ensure that the depths of the foundations are designed in accordance with the Chapter 4.2 of the NHBC standards⁶. The methodology provided in the guidance will require the identification of any trees, still present at, or recently removed from, the site and the distance from the proposed foundations. This may result in foundation depths greater than those given above and the requirement for heave protection to be employed against footings and below the underside of the floors and beams.

⁵ Assumes bulk density of material removed from footing excavations to be 20kN/m³

⁶ NHBC Standards, Chapter 4.2, *Building near trees*

8.3 Ground-floors

In light of the made ground and soft near surface soils, which were revealed to depths of up to 1.5m, it is not recommended that ground bearing ground floor slabs be employed. In this instance it would be necessary to suspend floors between foundation positions, such that the floor loads are transmitted via the foundations to competent soils at depth.

8.4 Access Roads, Drive-ways and Hard-standing

It is considered that any roads or hard-standing at the site could be constructed employing traditional pavement design. A design California Bearing Ratio (CBR) of 5% could be employed in the pavement design⁷. However, it is recommended that proof rolling of the sub-grade be undertaken to establish the suitability of the soils, to expose any soft or weak ground and to ensure the sub-grade is well compacted prior to construction. Any areas of soft or weak ground should be remediated by increasing the sub-base thickness. Alternatively, weak material could be locally removed and replaced with a compacted granular capping layer. If construction were to be undertaken during the winter or after periods of prolonged rainfall, it may be prudent to employ a geotextile and/or a geogrid between the sub-base and sub-grade.

8.5 Effect of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C1⁸, which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-1 requirements. Assuming static groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s.

In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1⁹, which can be found in Part D, *Specifying concrete for general cast-in-situ use*, of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

9. Further Work

- This report should be forwarded to the relevant authorities as soon as practicable to ensure they have sufficient time to review and discuss any issues.
- For adoptable road design, laboratory or insitu CBR testing could be undertaken in order to acquire the appropriate CBR value for pavement design.

⁷ Table 13/2 Design Manual for Roads and Bridges (1995), HA44/9: Volume 4 Section 1 Part 1, Highways Agency.

⁸ Table C1, *Aggressive Chemical Environment for Concrete (ACEC) classification for green field locations*

⁹ Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*

10. References

- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes*, B.S.I., London.
- British Standards Institution (2015) BS5930: *Code of practice for site investigations*, B.S.I., London.
- British Geological Survey (NERC) (2024), BGS, Keyworth.
 - Geology of Britain Viewer:
(http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)
 - Lexicon of Named Rock Units:
(<http://www.bgs.ac.uk/lexicon/>)
- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: Concrete in aggressive ground.
 - Part C: *Assessing the aggressive chemical environment.*
 - Part D: *Specifying concrete for general cast-in-situ use.*
- NHBC Standards, Chapter 4.2, *Building near trees*
- Design Manual for Roads and Bridges (1995), HA44/9: Volume 4 Section 1 Part 1, Highways Agency

Appendix 1

Site Plan



Notes:
Investigation positions approximated from site operative's notes.



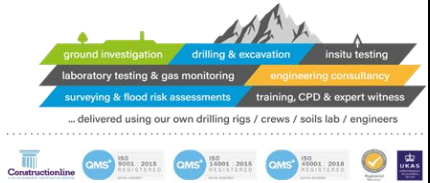
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Client:
Mkenny Properties Limited

Job Number:
C2623/23/E/6181

Project Details:
Brendon Avenue, Moston

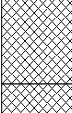
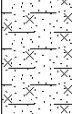
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Appendix 2

Windowless Sample Borehole Records

							Borehole Log			Borehole No. WS02 Sheet 1 of 1		
Project Name: Brendon Avenue							Project No. C2623/24/E/6181		Co-ords:		Hole Type WLS	
Location: Moston, Manchester M40 9DN							Level:		Scale 1:25		Logged By SH	
Client: MKenny Properties Limited							Dates: 22/01/2024					

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
							0.28			MADE GROUND (Soft to firm, brown, slightly sandy, gravelly, silty CLAY. Sand is fine to coarse, Gravel is fine to coarse and angular to sub-angular of brick, concrete and sandstone.	
	0.48			87	100	HVP=91				MADE GROUND (Soft to firm. grey becoming brown mottled grey, slightly gravelly, silty CLAY. Gravel is fine to medium and sub-angular to sub-rounded of coal and sandstone)	
	0.58					HVP=76					
	0.70					HVP=82					
	0.80	D				HVP=76	0.81				
	0.80										
	1.00	SPT				N=5 (1,0/2,1,1,1)			REWORKED Loose, brown and grey, clayey, silty, fine to coarse SAND. TILL	1	
	1.20	B									
	1.20 - 1.45	D									
					87	100		1.48		Stiff to very stiff, brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is fine to medium and angular to sub-rounded of coal, sandstone and mudstone. TILL	
	1.60	D									
	1.75					HVP=44					
	1.80					HVP=78					
	1.86					HVP=141					
	1.90	D									
	1.94					HVP=145					2
	2.00 - 2.45	D									
	2.00	SPT				N=26 (2,2/4,6,7,9)					
											
2.38				77	100	HVP=110					
2.50					HVP=113						
2.69					HVP=172						
2.86											
2.90	D										
2.93											
3.00	SPT				N=65 (9,11/14,17,15,19)				3		
							3.45				
									End of Borehole at 3.45m		
										4	
										5	

Remarks
 

Appendix 3

Trial Pit Records



Trial Pit Log

Trialpit No
HDTP01
Sheet 1 of 1

Project Name:	Brendon Avenue	Project No.	C2623/24/E/6181	Co-ords:	-	Date	22/01/2024
Location:	Moston, Manchester M40 9DN			Dimensions (m):		Scale	1:25
Client:	MKenny Properties Limited			Depth		1.20	Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	1.00 - 1.20	D		1.00			MADE GROUND (Soft to firm. grey becoming brown mottled grey, slightly gravelly, silty CLAY. Gravel is fine to medium and sub-angular to sub-rounded of coal and sandstone) REWORKED	
				1.20			Soft to firm, grey mottled brown, sandy, slightly gravelly, silty CLAY. Sand is fine to coarse. Gravel is fine to medium and sub-angular to sub-rounded of coal and sandstone.	1
							End of pit at 1.20 m	2
								3
								4
								5

Remarks:	
Stability:	

Appendix 4

Laboratory Testing – Geotechnical

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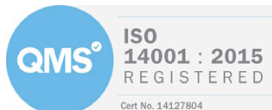


LABORATORY REPORT

job number	C/2623/24/E/6181	date	07/02/2024
site address	Land on Brendon Avenue Moston, Manchester, Greater Manchester, M40 9DN		
date scheduled	26/01/2024	date issued	07/02/2024
issued by	H J Letch		



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Schedule of UKAS Accredited Laboratory Tests



1. CLASSIFICATION OF SOIL	BS 1377-2:1990	BS EN ISO 17892	Accredited (A)	Unaccredited (U)
1.1 Moisture / Water content determination				
i. Oven drying	Pt 2 : 3.2	Pt 1 : 2014 Pt 12 : 2018 : 5.3 / 5.5	A	
ii. Saturation m/c of chalk	Pt 2 : 3.3			U
1.2 Index Properties				
i. Liquid limit – cone penetrometer	Pt 2 : 4.3		A	
ii. Plastic limit	Pt 2 : 5.3		A	
iii. Shrinkage limit	Pt 2 : 6.3			U
iv. Linear shrinkage	Pt 2 : 6.5		A	
1.3 Particle Density				
i. Gas jar	Pt 2 : 8.2		A	
ii. Large pycnometer	Pt 2 : 8.3			U
iii. Small pycnometer	Pt 2 : 8.4	Pt 3 : 2015 : 5.1		U
1.4 Density Tests				
i. Linear measurement	Pt 2 : 7.2	Pt 2 : 2014 : 5.1	A	
ii. Immersion in water	Pt 2 : 7.3	Pt 2 : 2014 : 5.2		U
iii. Fluid / Water displacement	Pt 2 : 7.4	Pt 2 : 2014 : 5.3		U
iv. Sand replacement	Pt 9 : 2.1, 2.2			U
v. Core cutter	Pt 9 : 2.4			U
1.5 Particle Size Distribution				
i. Dry Sieve	Pt 2 : 9.2	Pt 4 : 2016 : 5.2	A	
ii. Wet Sieve	Pt 2 : 9.3	Pt 4 : 2016 : 5.2	A	
iii. Sedimentation by pipette	Pt 2 : 9.4	Pt 4 : 2016 : 5.3 / 5.4	A	
iv. Sedimentation by hydrometer	Pt 2 : 9.5			U
2. CHEMICAL TESTS	BS 1377-3:2018			
ii. Mass loss on ignition	Pt 3 : 4			U
3. COMPACTION RELATED TESTS	BS 1377-4:1990			
3.1 Dry density/moisture relationship				
i. 2.5kg rammer – 1 litre mould	Pt 4 : 3		A	
- CBR mould	Pt 4 : 3		A	
ii. 4.5kg rammer – 1 litre mould	Pt 4 : 3		A	
- CBR mould	Pt 4 : 3		A	
3.2 Moisture Condition Value				
i. Single point test	Pt 4 : 5.4			U
ii. MCV/moisture content relationship	Pt 4 : 5.5			U
3.3 California Bearing Ratio				
i. Undisturbed sample	Pt 5 : 7		A	
ii. Recompacted sample	Pt 5 : 7		A	
iii. Soaked, inc measurement of swell	Pt 5 : 7		A	
4. COMPRESSIBILITY OF SOIL	BS 1377-5:1990			
i. One dimensional consolidation	Pt 5 : 3		A	
ii. Swelling pressure test	Pt 5 : 3			U
5. SHEAR STRENGTH OF SOIL	BS 1377-7:1990			
i. Hand shear vane	Makers instructions			U
ii. Shear box (100mm square sample)	BS 1377 : Pt 7 : 4			U
iii. Triaxial – quick undrained	BS 1377 : Pt 7 : 8, 9		A	
6. PERMEABILITY				
i. Falling head	K. H. Head Vol 2			U
ii. Constant head	BS 1377 : Pt 6 : 6			U
iii Triaxial cell	BS 1377 : Pt 6 : 6			U
7. ROCK TESTS				
7.1 Classification Tests				
i. Natural moisture content	-			U
ii. Saturated moisture content	-			U
iii. Natural density	-			U
iv. Porosity	-			U
7.2 Strength Tests				
i. Point load index	ISRM '85			U
ii. Uniaxial compression test	ISRM '81			U

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Disclaimer

The results reported herein relate only to the material supplied to the laboratory.



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GEOTECHNICAL TESTING RESULTS

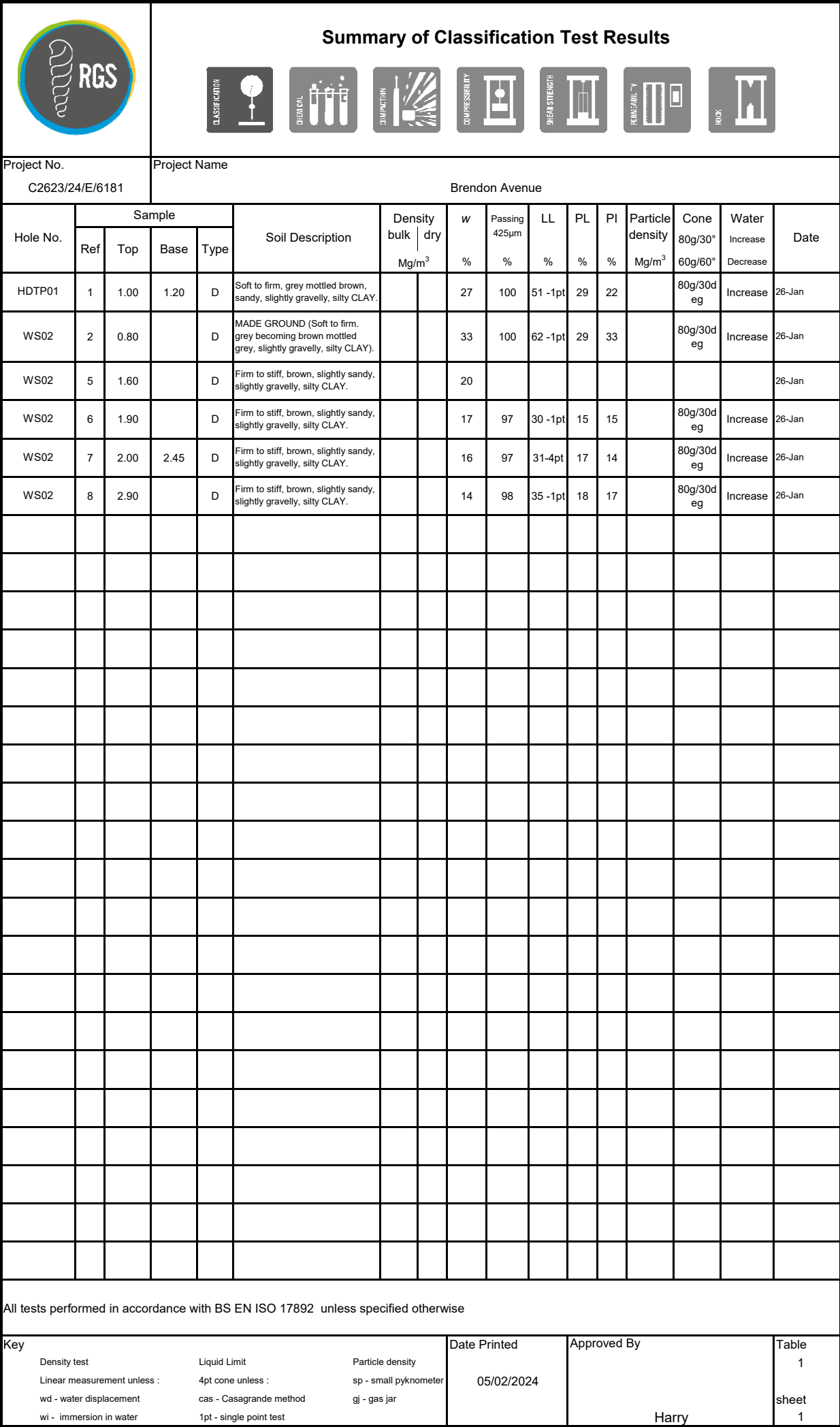


Please consider the environment before printing this report.



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Near Bank, Shelley,
Huddersfield,
HD8 8LU

Classification of Index Properties

C2623/24/E/6181

Project Name: Brendon Avenue

BS EN ISO: 17892: Parts 1, 12

Fig. 2
Sheet. 1

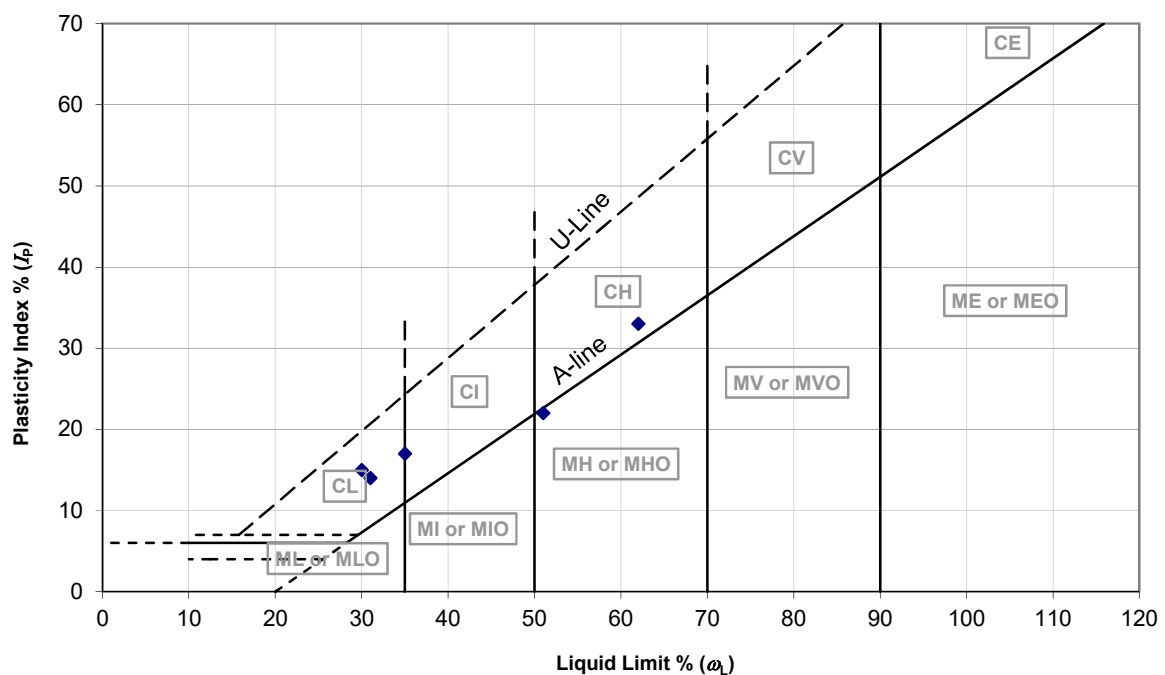
Location:

Input By: Harry

Client: MKenny Properties Limited

Check By: Harry

Location	Depth (m)	Water Content (ω) (%)	Liquid Limit (ω_L) (%)	Plastic Limit (ω_P) (%)	Plasticity Index (I_P) (%)	Retained by 0.425mm (%)	Modified (ω) (ω') (%)	Modified (I_P) (I_P') (%)	Liquidity/ Consistency		Casagrande Class	N.H.B.C Class (%)
									(I_L) (%)	(I_C) (%)		
HDTP01	1.00	26.7	51	29	22	0	27	22	-0.1	1.1	M H	MEDIUM
WS02	0.80	32.9	62	29	33	0	33	33	0.1	0.9	C H	MEDIUM
WS02	1.90	16.7	30	15	15	3	17	15	0.1	0.9	C L	LOW
WS02	2.00	16.2	31	17	14	3	17	14	-0.1	1.1	C L	LOW
WS02	2.90	14.3	35	18	17	2	15	17	-0.2	1.2	C I	LOW





PARTICLE SIZE DISTRIBUTION

Job Ref

C2623/24/E/6181

Borehole/Pit No.

WS02

Site Name

Brendon Avenue

Sample No.

3

Soil Description

Medium dense, brown and grey, clayey, silty, fine to coarse SAND.

Depth, m

1.20

Specimen
Reference

3

Specimen
Depth

1.2

m

Sample Type

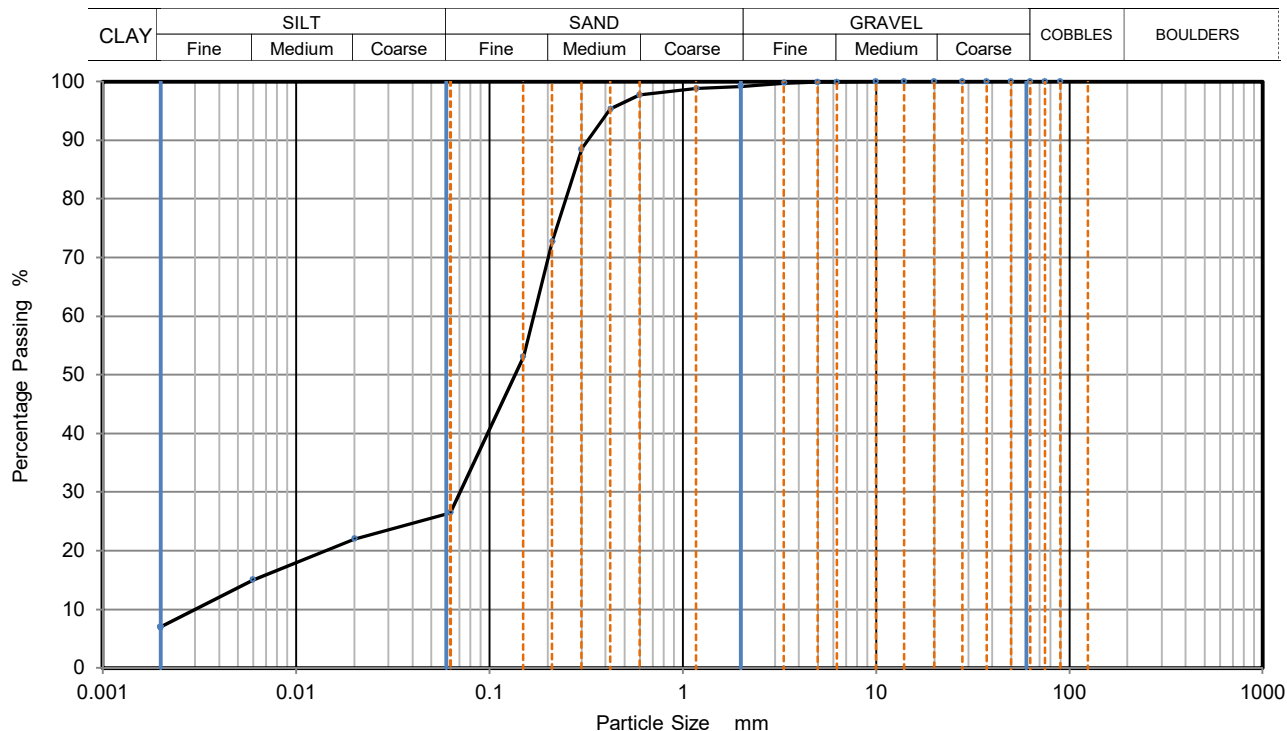
B

Test Method

ISO 17892 -4, by sieving and pipette sedimentation

KeyLAB ID

3



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
	100	0.0201	22
90	100	0.0060	15
75	100	0.0020	7
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	98	Particle density (assumed) 2.65 Mg/m3	
0.425	95		
0.3	88		
0.212	73		
0.15	53		
0.063	27		

Dry Mass of sample, g

2065

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	72
Silt	20
Clay	7

Grading Analysis		
D ₁₀₀	mm	10
D ₆₀	mm	0.17
D ₃₀	mm	0.0705
D ₁₀	mm	0.00305

Remarks

Preparation and testing in accordance with BS EN ISO 17892 - 4, unless noted below

Test performance date: 07/02/2024

Operator

Checked

Approved

Sheet printed

Fig 3

Harry

Harry

Harry

07/02/2024

Sheet 1

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES Tested in accordance with BS 1377:1990:Part 5:Clause 3 TEST REPORT

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES Tested in accordance with BS 1377:1990:Part 5:Clause 3 TEST REPORT

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES Tested in accordance with BS 1377:1990:Part 5:Clause 3 TEST REPORT

Project location	Bendon Avenue		
Project reference	C2623/24/E/6181	Sample depth (m)	1.60
Borehole number	WS02	Sample type	Undisturbed
Sample number	C5	Specimen orientation	Vertical
		Specimen depth (m)	1.60
Sample description	Firm to stiff brown slightly sandy silty CLAY.		
Preparation method	Prepared from a sample tube in accordance with BS 1377:2016:Part 1:Clause 9.6		
Particle density (Mg/m³)	2.65 (Assumed)	Swelling pressure (kPa)	

INITIAL CONDITIONS	
Height (mm)	20.15
Diameter (mm)	50.47
Moisture content (trimmings) (%)	19
Bulk density (Mg/m ³)	2.10
Dry density (Mg/m ³)	1.76
Voids ratio	0.502
Degree of saturation (%)	100

Comments / variations from procedures:

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES Tested in accordance with BS 1377:1990:Part 5:Clause 3 TEST REPORT
--

Project location	<i>Bendon Avenue</i>		
Project reference	<i>C2623/24/E/6181</i>	Sample depth (m)	<i>1.60</i>
Borehole number	<i>WS02</i>	Sample type	<i>Undisturbed</i>
Sample number	<i>C5</i>	Specimen orientation	<i>Vertical</i>
Tested	<i>HJL</i>	Checked	<i>EC</i>
Date	<i>30/01/2024</i>	Date	<i>30/01/2024</i>
		Approved	<i>HJL</i>
		Date	<i>05/02/2024</i>

Average laboratory temperature (°C)		14	Method of time fitting	<i>Log time</i>
Pressure stage	Coefficient of consolidation	Coefficient of volume compressibility	Coefficient of secondary compression	
(kPa)	c_v (m ² /year)	m_v (m ² /MN)	c_{sec} (-)	
<i>0 - 30</i>	<i>1.3</i>	<i>0.32</i>	<i>0.00071</i>	
<i>30 - 60</i>	<i>1.7</i>	<i>0.26</i>	<i>0.0012</i>	
<i>60 - 120</i>	<i>2.8</i>	<i>0.17</i>	<i>0.0011</i>	
<i>120 - 240</i>	<i>3.7</i>	<i>0.11</i>	<i>0.00066</i>	
<i>240 - 30</i>	-	-	-	

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Tested in accordance with BS 1377:1990:Part 5:Clause 3

TEST REPORT

Project location	<i>Bendon Avenue</i>	Sample depth (m)	<i>1.60</i>
Project reference	<i>C2623/24/E/6181</i>	Sample type	<i>Undisturbed</i>
Borehole number	<i>WS02</i>	Specimen orientation	<i>Vertical</i>
Sample number	<i>C5</i>		

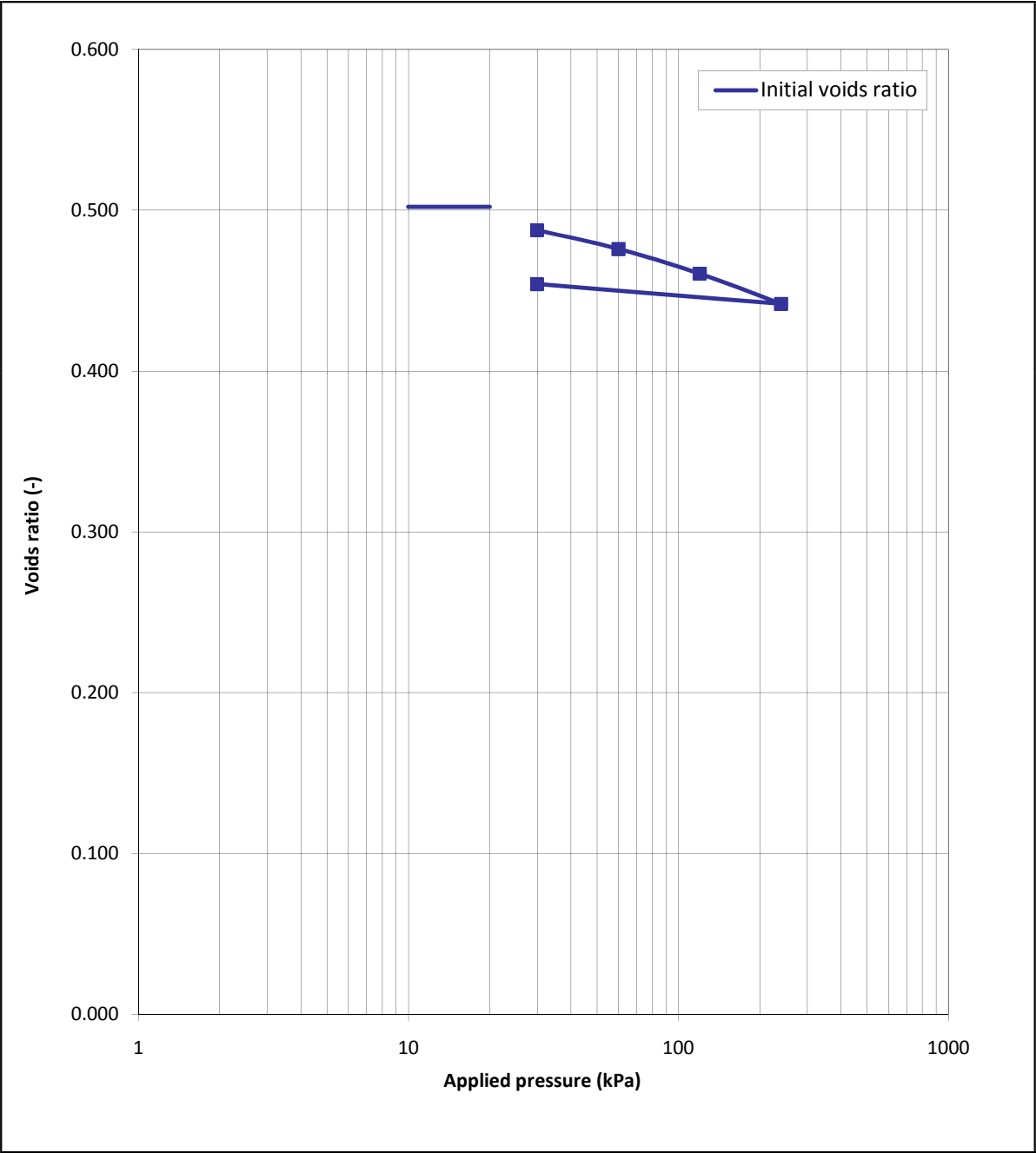
Tested	<i>HJL</i>	Checked	<i>EC</i>	Approved	<i>HJL</i>
Date	<i>30/01/2024</i>	Date	<i>30/01/2024</i>	Date	<i>05/02/2024</i>

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Tested in accordance with BS 1377:1990:Part 5:Clause 3

TEST REPORT

Project location	Bendon Avenue	Sample depth (m)	1.60
Project reference	C2623/24/E/6181	Sample type	Undisturbed
Borehole number	WS02	Specimen orientation	Vertical
Sample number	C5		

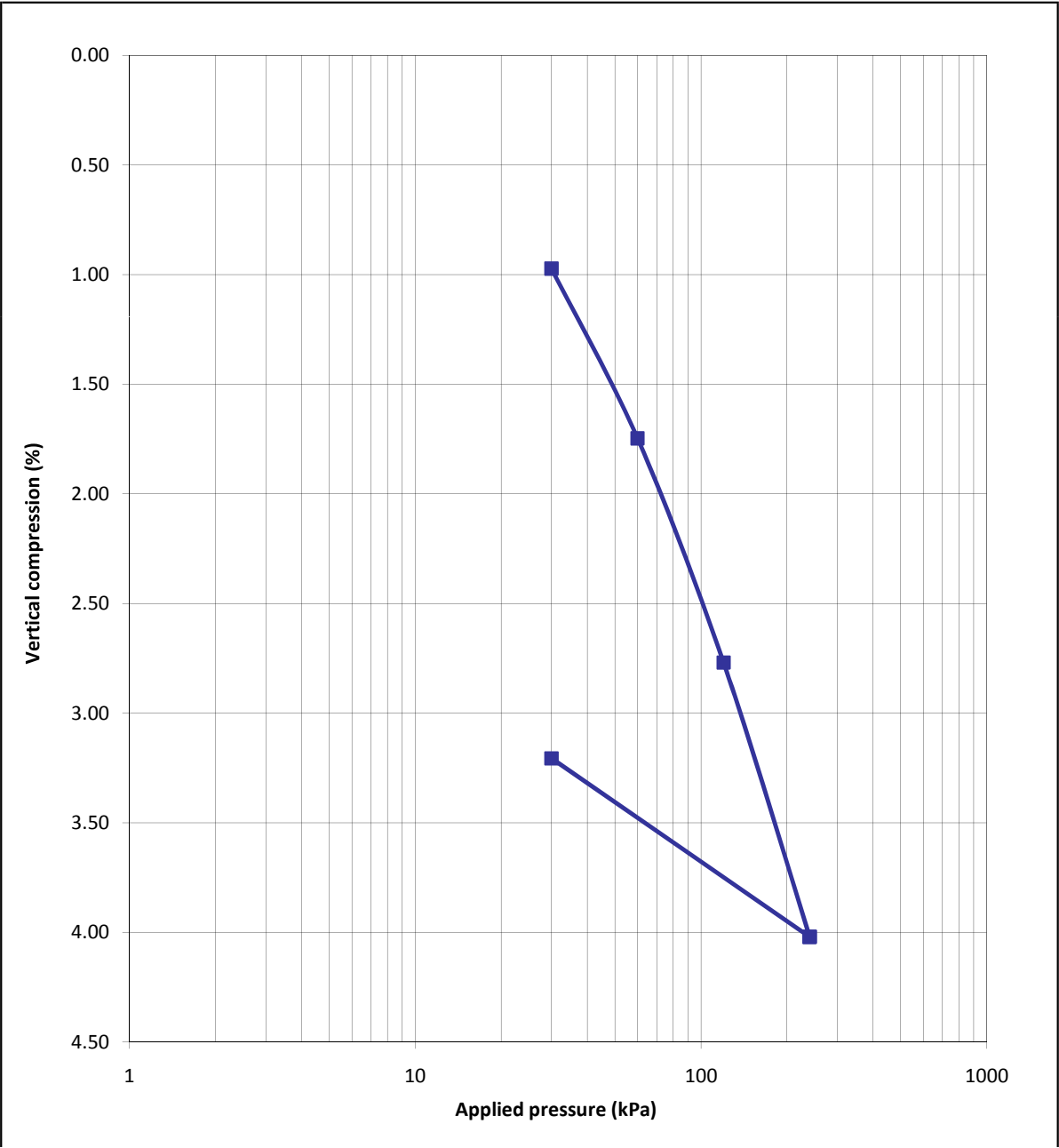


DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Tested in accordance with BS 1377:1990:Part 5:Clause 3

TEST REPORT

Project location	<i>Bendon Avenue</i>			Sample depth (m)	<i>1.60</i>
Project reference	<i>C2623/24/E/6181</i>			Sample type	<i>Undisturbed</i>
Borehole number	<i>WS02</i>			Specimen orientation	<i>Vertical</i>
Sample number	<i>C5</i>				
Tested	<i>HJL</i>	Checked	<i>EC</i>	Approved	<i>HJL</i>
Date	<i>30/01/2024</i>	Date	<i>30/01/2024</i>	Date	<i>05/02/2024</i>



DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
Tested in accordance with BS 1377:1990:Part 5:Clause 3
TEST REPORT

Project location	<i>Bendon Avenue</i>	Sample depth (m)	<i>1.60</i>
Project reference	<i>C2623/24/E/6181</i>	Sample type	<i>Undisturbed</i>
Borehole number	<i>WS02</i>	Specimen orientation	<i>Vertical</i>
Sample number	<i>C5</i>		

Tested	<i>HJL</i>	Checked	<i>EC</i>	Approved	<i>HJL</i>
Date	<i>30/01/2024</i>	Date	<i>30/01/2024</i>	Date	<i>05/02/2024</i>

[illegible]



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End of Report



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