

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

WBH103

Top Depth (m):

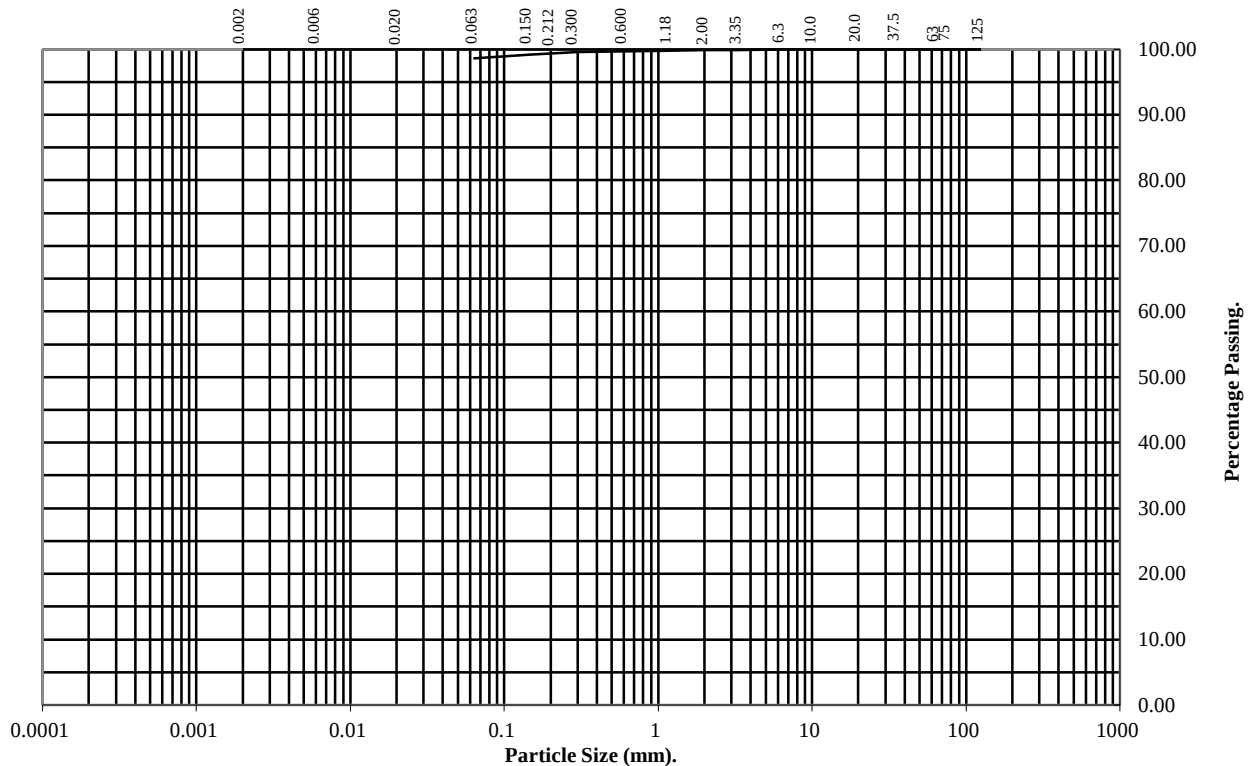
3.00

Sample Number:

Base Depth(m):

Sample Type:

D



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	100
0.212	99
0.15	99
0.063	99

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	1
Silt/Clay	99

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7582
Client Ref:
WIE17469

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number:

WBH103

Top Depth (m):

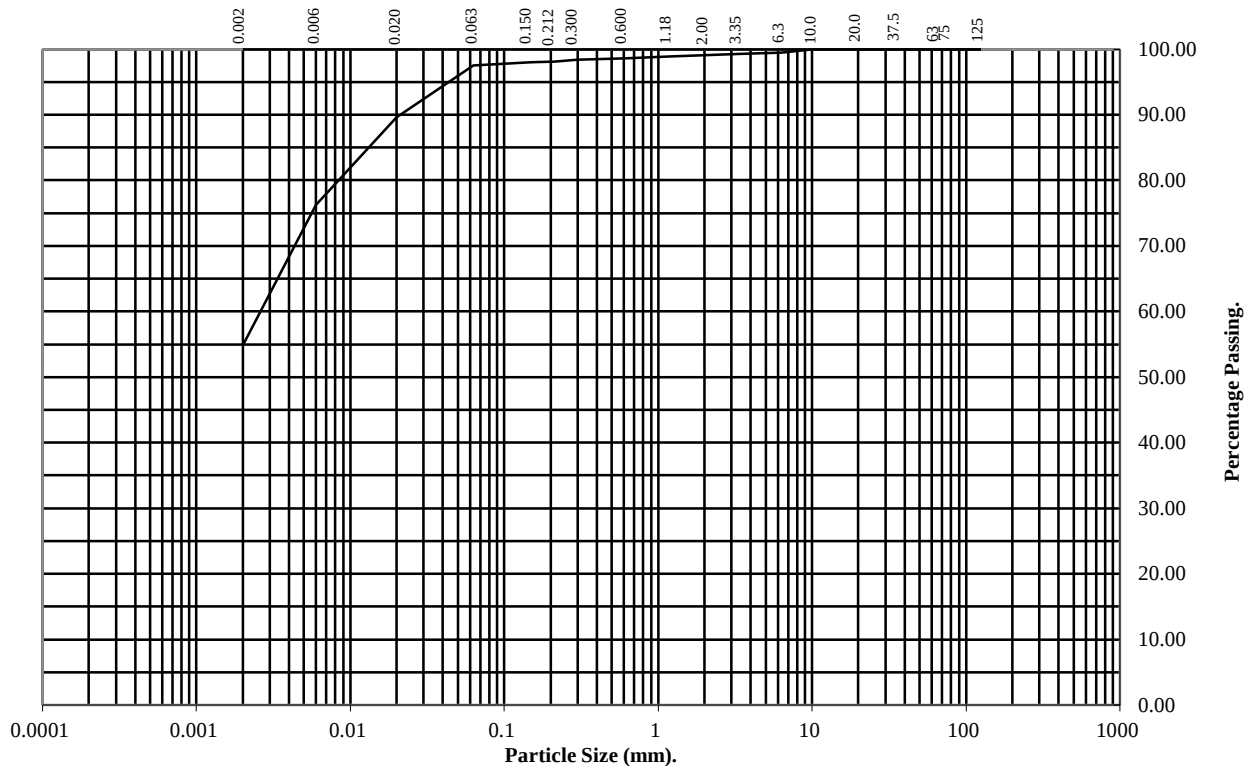
14.50

Sample Number:

Base Depth(m):

Sample Type:

B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	99
2	99
1.18	99
0.6	99
0.3	98
0.212	98
0.15	98
0.063	98

Particle Diameter	Percentage Passing
0.02	90
0.006	76
0.002	55

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	1
Silt	43
Clay	55

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

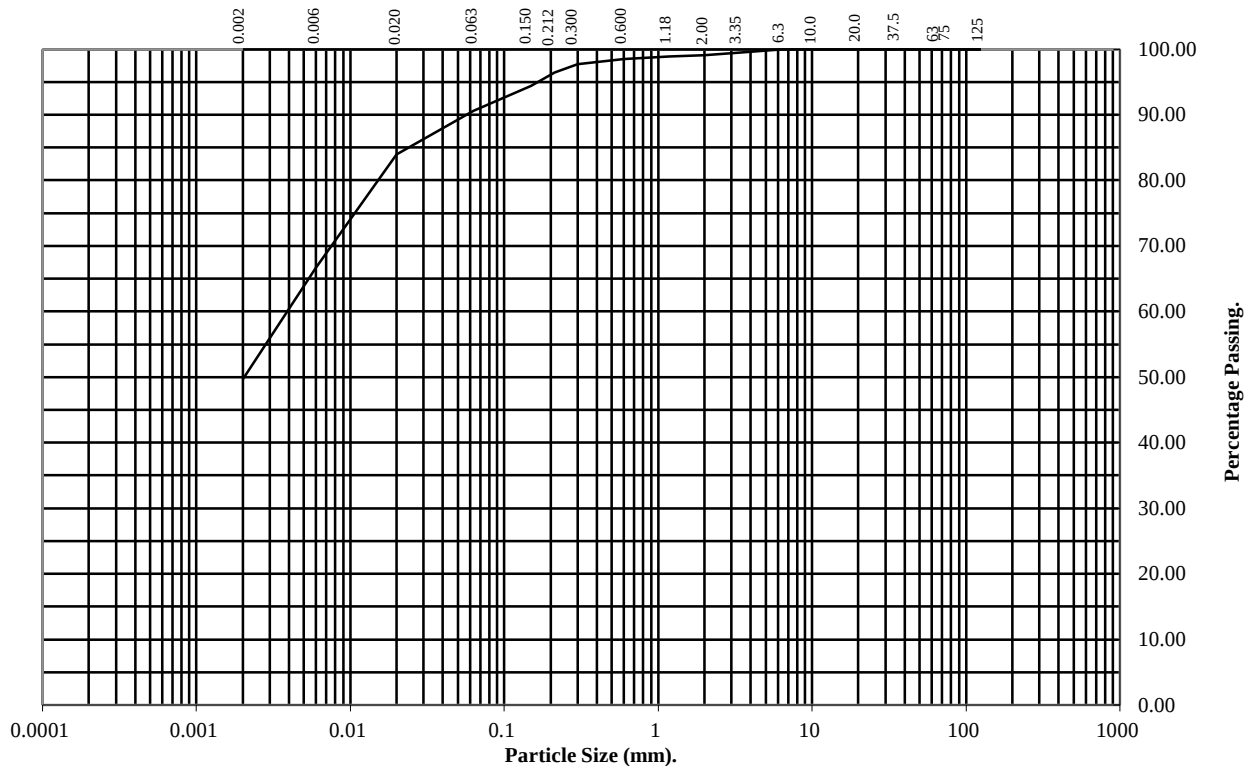
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **WBH103** Top Depth (m): **23.00**

Sample Number: Base Depth(m):

Sample Type: **D**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	99
1.18	99
0.6	99
0.3	98
0.212	96
0.15	94
0.063	91

Particle Diameter	Percentage Passing
0.02	84
0.006	67
0.002	50

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	8
Silt	41
Clay	50

Remarks:
See Summary of Soil Descriptions



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Client Ref:
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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

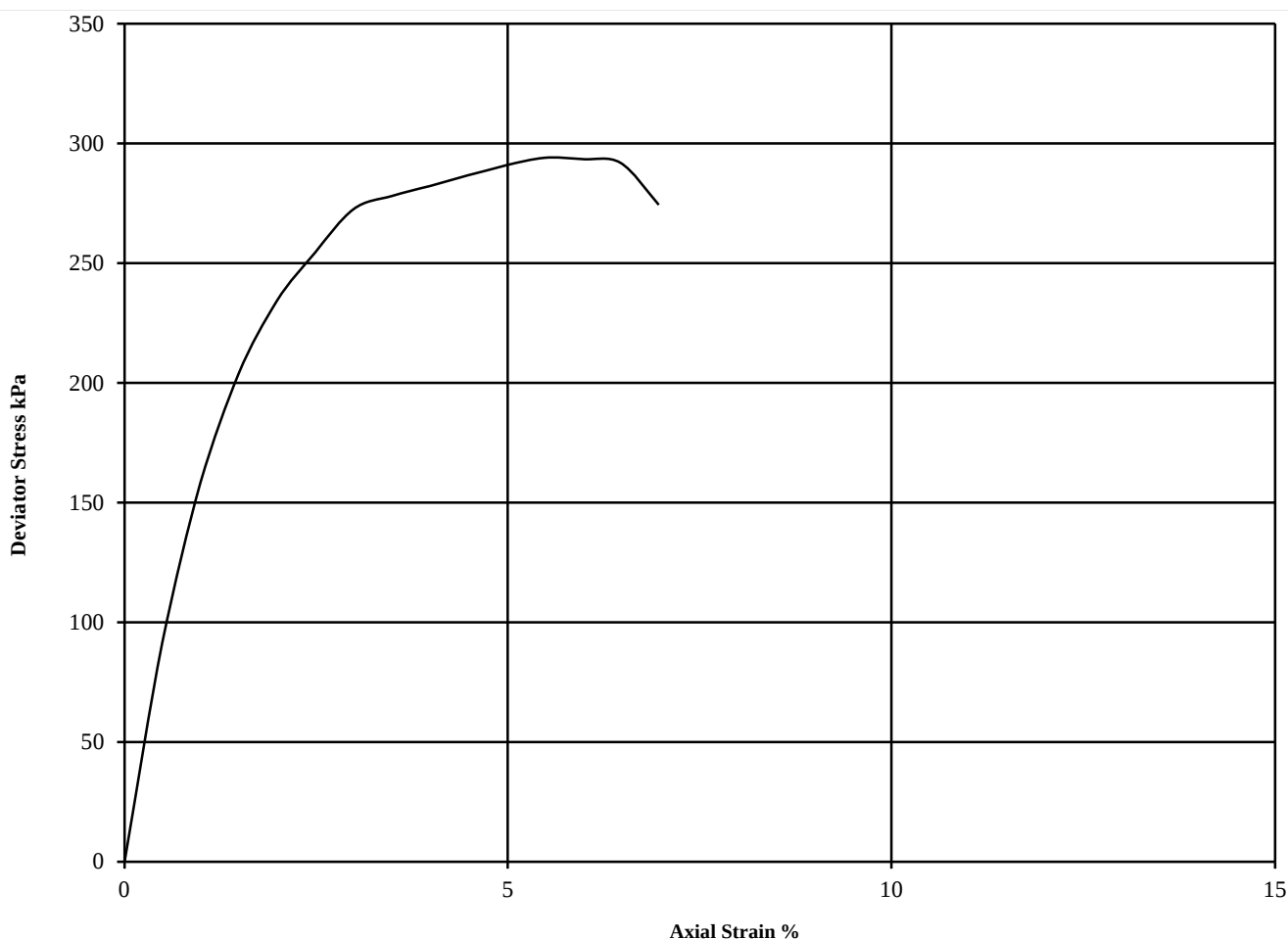
Hole Number: WBH103

Top Depth (m): 13.50

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		103		Height (mm):		207		Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36 See summary of soil descriptions		
1	27	1.94	1.54	270	294	147	5.5	Brittle			



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Contract No:

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Client Ref:

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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

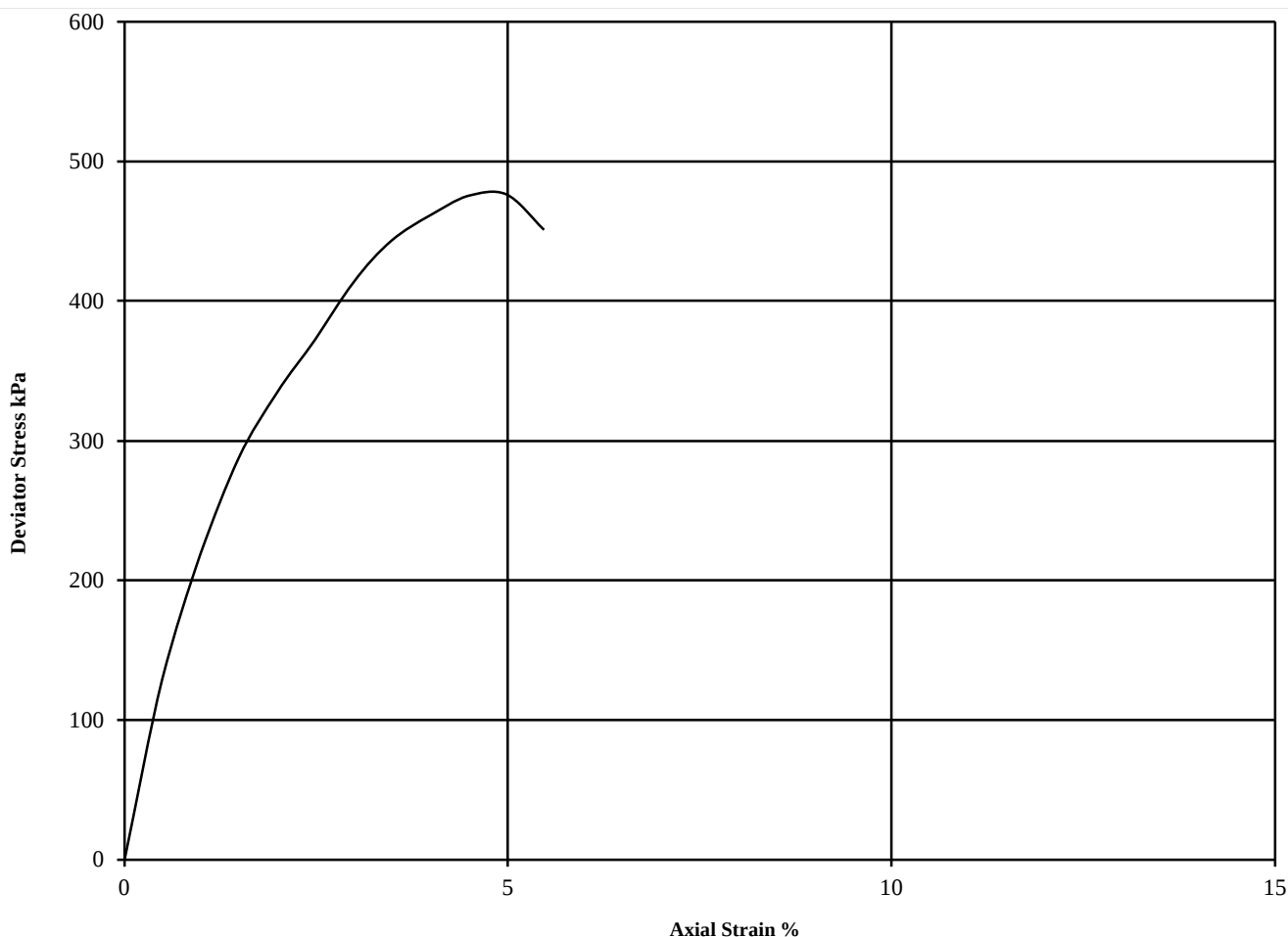
Hole Number: WBH103

Top Depth (m): 22.50

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36 See summary of soil descriptions
					$(\sigma_1 - \sigma_3)_f$	$\frac{1}{2}(\sigma_1 - \sigma_3)_f$			
1	27	1.95	1.54	450	476	238	5.0	Brittle	



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ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: WBH103

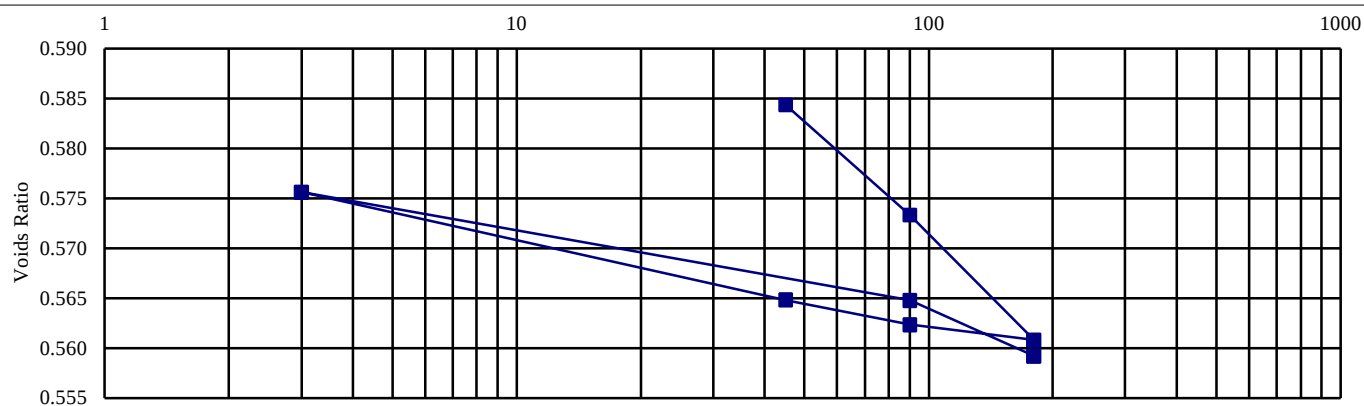
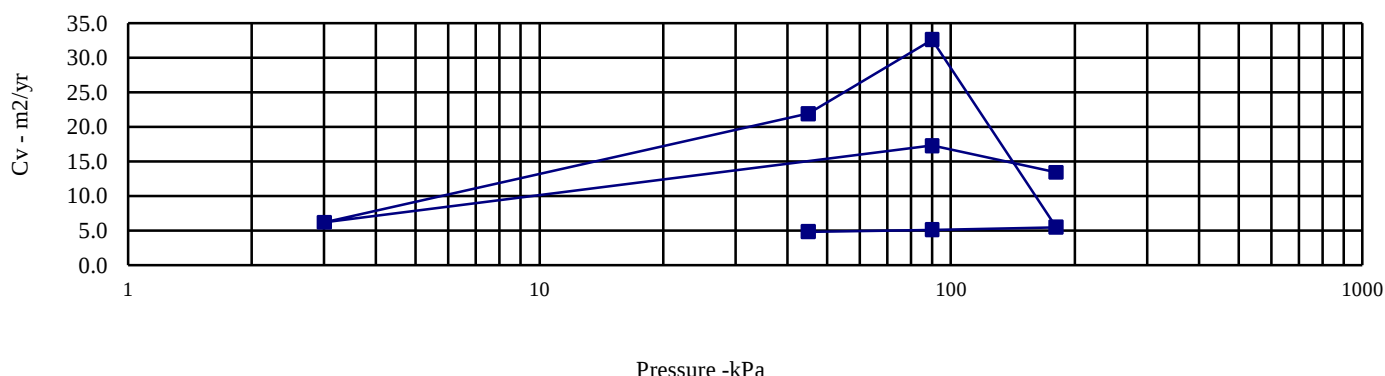
Top Depth (m): 4.50

Sample Number:

Base Depth (m) :

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	23	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.02	0	45	0.334	4.867	Method used to	
Dry Density (Mg/m3):	1.65	45	90	0.154	5.129	determine CV:	T90
Voids Ratio:	0.609	90	180	0.088	5.488	Nominal temperature	
Degree of saturation:	98.3	180	90	0.011	32.612	during test ' C:	20
Height (mm):	20.03	90	45	0.035	21.905	Remarks:	
Diameter (mm)	75.043	45	3	0.164	6.212	See summary of soil descriptions	
Particle Density (Mg/m3):	2.65	3	90	0.079	17.278		
Assumed		90	180	0.039	13.412		



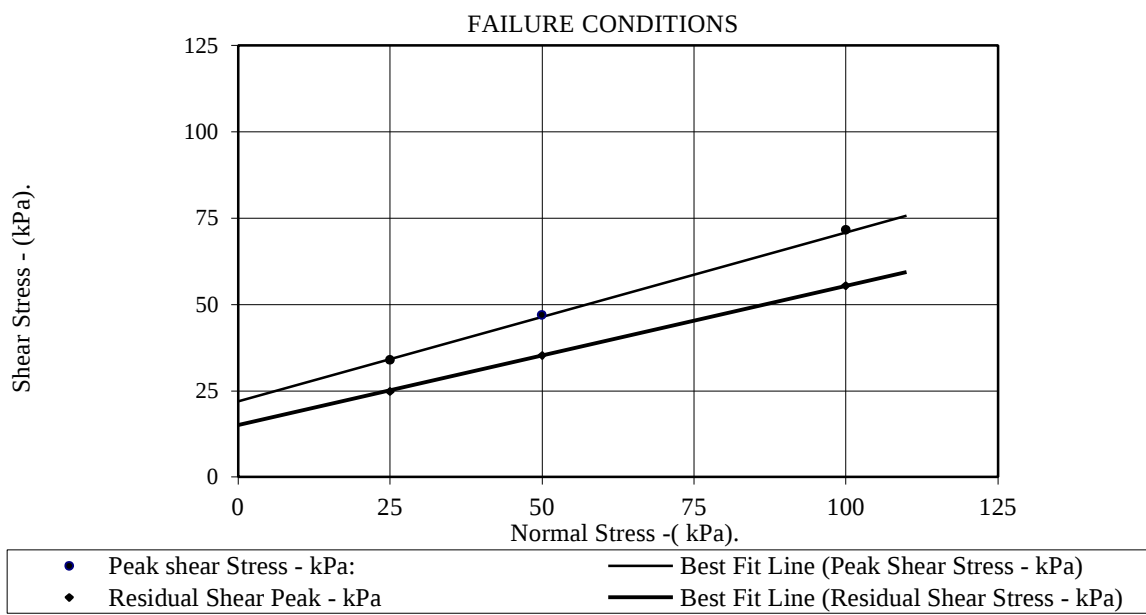
Project Otter

Contract No:
PSL22/7582
Client Ref:
WIE17469

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377 : 1990 Part 7 Clause 4

Hole Number:	WBH103		Top Depth	2.50	
Sample Number:			Base Depth		
Sample Conditions:	Submerged		Sample Type	U	
Particle Density - Mg/m3:	2.65	Assumed	Remarks:		
Specimen Preparation	Cut and trimmed Undisturbed				
Sample Description:	See summary of soil descriptions				
STAGE			1	2	3
Initial Conditions					
Height - mm:			19.99	19.99	19.99
Length - mm:			60.05	60.05	60.05
Moisture Content - %:			25	25	25
Bulk Density - Mg/m3:			2.01	2.01	2.01
Dry Density - Mg/m3:			1.61	1.61	1.61
Voids Ratio:			0.647	0.647	0.647
Normal Pressure- kPa			25	50	100
Consolidation Stage					
Consolidated Height - mm:			19.60	19.40	19.06
Peak Shear					
Rate of Strain - mm/min			0.043	0.043	0.043
Displacement at peak shear stress - mm			3.00	3.90	5.10
Peak shear Stress - kPa:			34	47	72
Residual Shear					
Rate of Strain - mm/min			0.086	0.086	0.086
Displacement at residual shear stress - mm			29.00	28.10	30.00
Residual shear Stress - kPa:			25	35	55
Final Consolidation Conditions					
Moisture Content - %:			27	26	24
Bulk Density - Mg/m3:			2.05	2.07	2.11
Dry Density - Mg/m3:			1.62	1.65	1.70
Peak Shear					
Angle of Shearing Resistance:(0)			26		
Effective Cohesion - kPa:			22		
Residual Shear					
Angle of Shearing Resistance:(0)			22		
Effective Cohesion - kPa:			15		



Project Otter

Contract No:

PSL22/7582

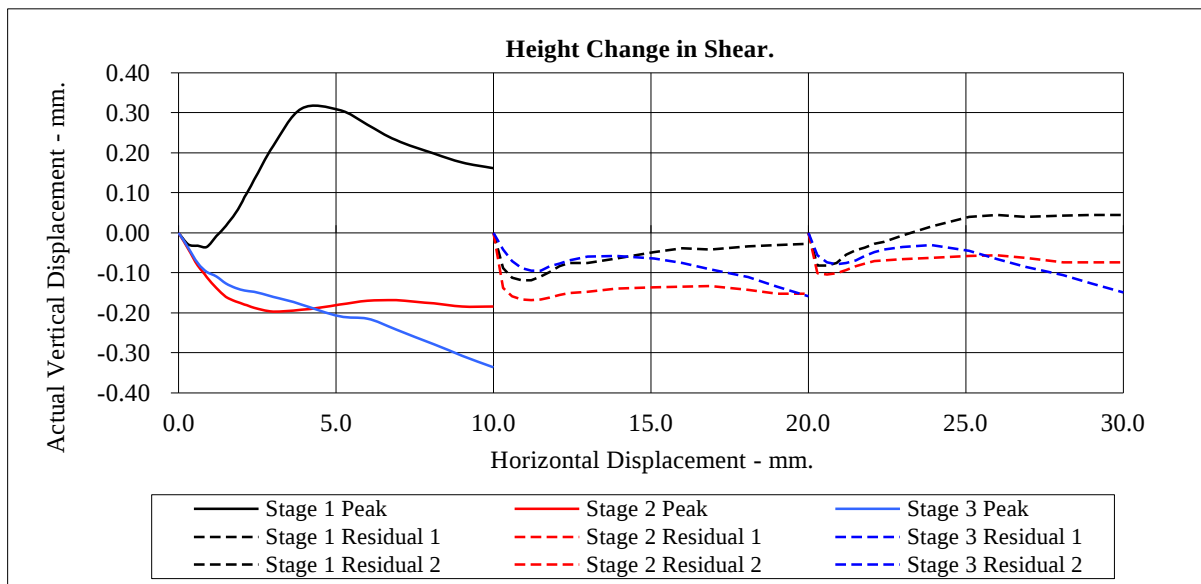
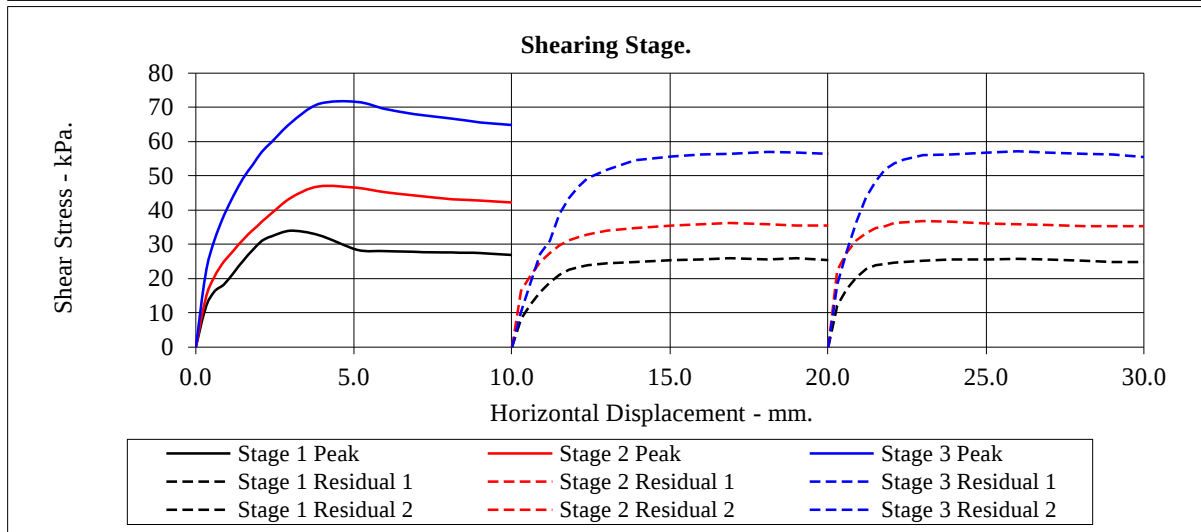
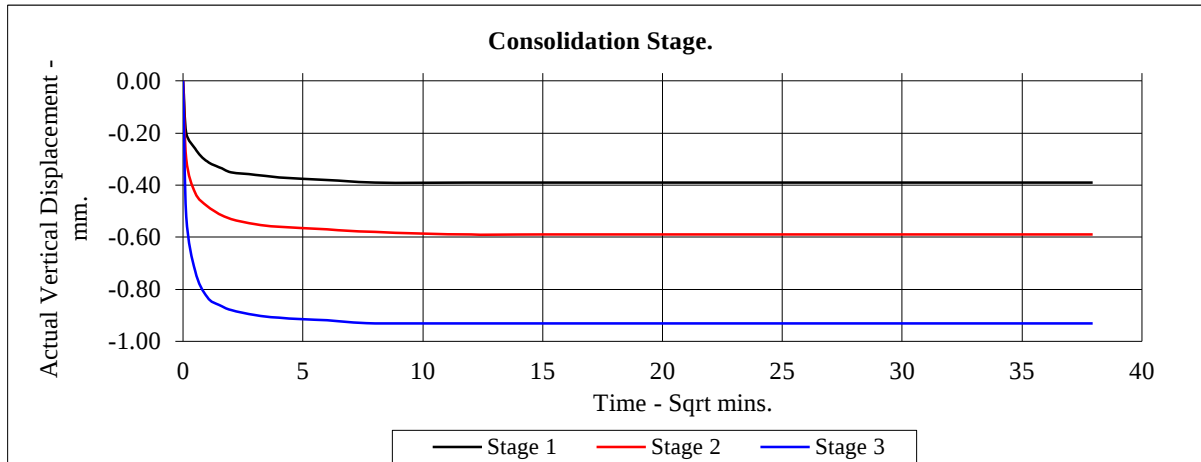
Client Ref:

WIE17469

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377 : 1990 Part 7 Clause 4

Hole Number:	WBH103	Top Depth:	2.50
Sample Number:		Base Depth:	



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Project Otter

Contract No:
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Client Ref:
WIE17469



Certificate of Analysis

Certificate Number 22-25486

Issued: 16-Dec-22

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 22-25486

Client Reference PSL22/7304

Order No (not supplied)

Contract Title WIE17469: Project Otter

Description 2 Soil samples.

Date Received 09-Dec-22

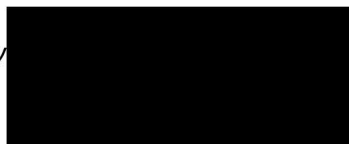
Date Started 09-Dec-22

Date Completed 16-Dec-22

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

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

Approved By



Kirk Bridgewood
General Manager



2139

Summary of Chemical Analysis

Soil Samples

Our Ref 22-25486

Client Ref PSL22/7304

Contract Title WIE17469: Project Otter

Lab No	2096380	2096381
Sample ID	WBH113	WBH113
Depth	11.00	24.50
Other ID		
Sample Type	SOIL	SOIL
Sampling Date	22/11/2022	22/11/2022
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Metals					
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	17	13
Inorganics					
pH	DETSC 2008#		pH	8.0	8.1
Chloride Aqueous Extract	DETSC 2055	1	mg/l	28	30
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	< 1.0	< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	350	270
Sulphur as S, Total	DETSC 2320	0.01	%	0.26	0.16
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.26	0.18

Information in Support of the Analytical Results

Our Ref 22-25486
 Client Ref PSL22/7304
 Contract WIE17469: Project Otter

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2096380	WBH113 11.00 SOIL	22/11/22	PT 500ml	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2096381	WBH113 24.50 SOIL	22/11/22	PT 500ml	Total Sulphur ICP (7 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



LABORATORY REPORT



4043

Contract Number: PSL22/7847

Report Date: 18 January 2023
Client's Reference: WIE17469-WBH104
Client Name: Groundtech Consulting
First Floor
Lloyd House
Orford Court
Greenfold Way
WN7 3XJ

For the attention of: Michael Berry

Contract Title: Project Otter

Date Received: 9/12/2022
Date Commenced: 9/12/2022

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)



L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

M Fennell
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
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e-mail: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

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Project Otter

Contract No:

PSL22/7847

Client Ref:

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SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



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Project Otter

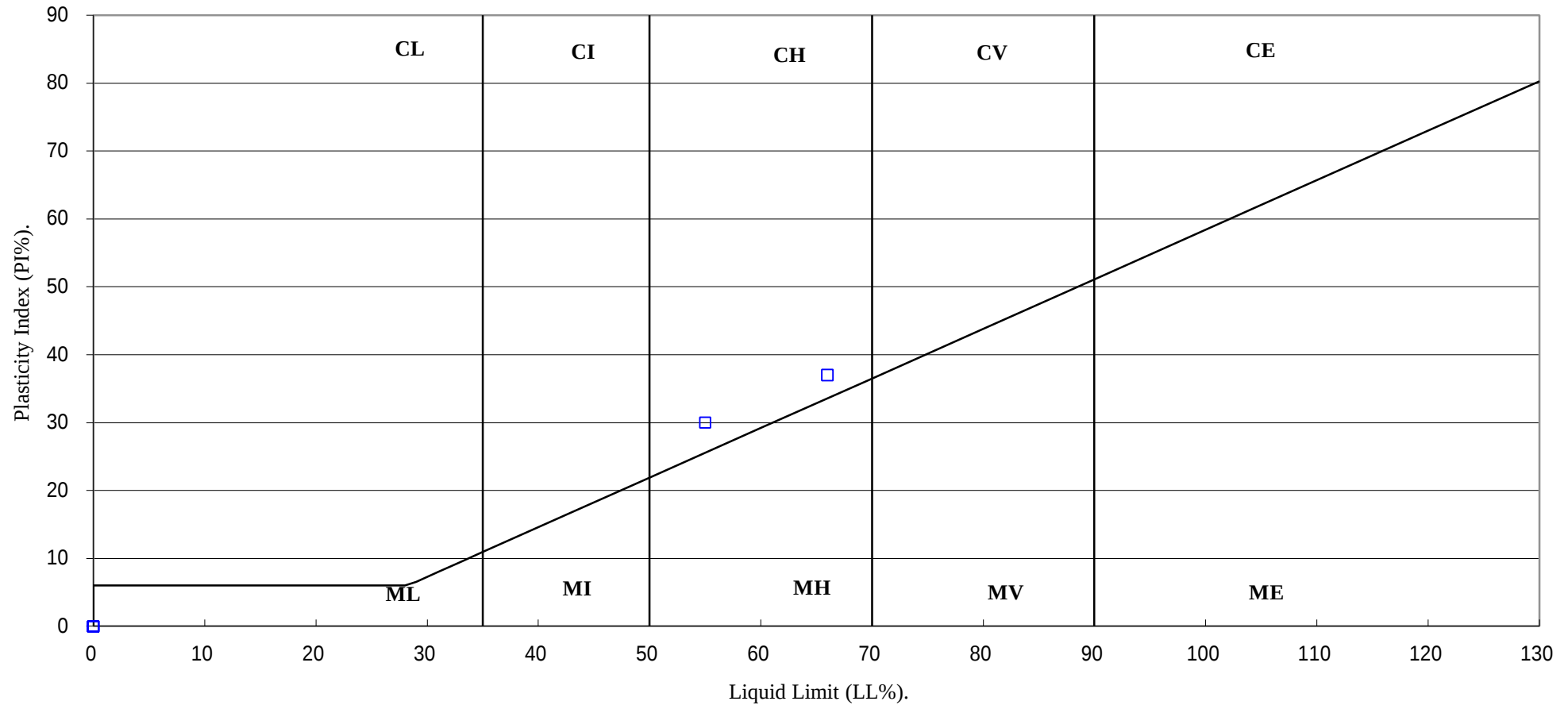
Contract No:

PSL22/7847

Client Ref:

WIE17469

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



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Contract No:

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Client Ref:

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CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

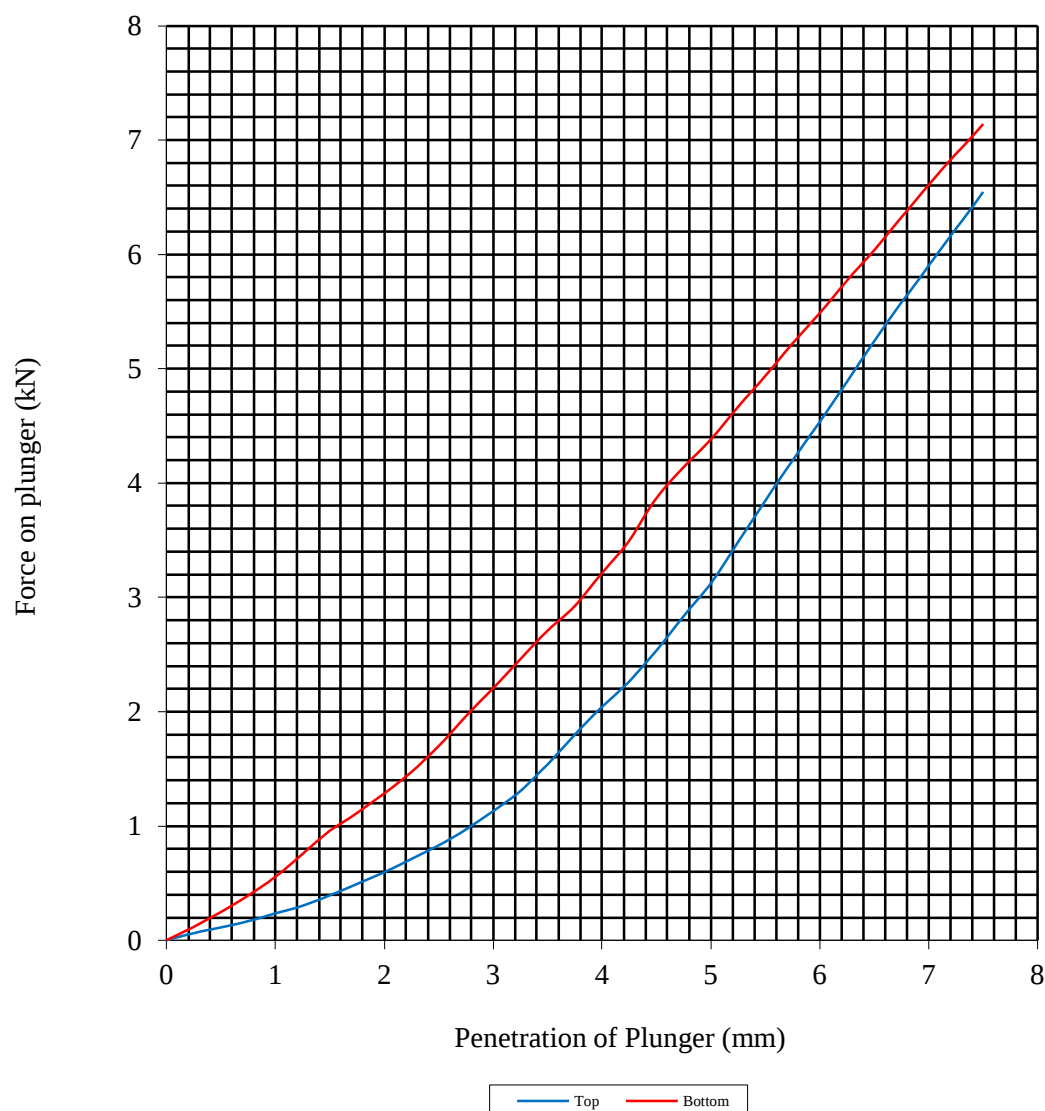
Hole Number: WBH104

Top Depth (m): 0.20

Sample Number:

Base Depth (m): 0.80

Sample Type: AMAL



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	16	Surcharge Kg:	4.20	Sample Top	20	Sample Top	15.6
Bulk Density Mg/m3:	2.19	Soaking Time hrs	96	Sample Bottom	18	Sample Bottom	21.9
Dry Density Mg/m3:	1.88	Swelling mm:	2.26	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:		24					
Compaction Conditions		2.5kg					



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PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

WBH104

Top Depth (m):

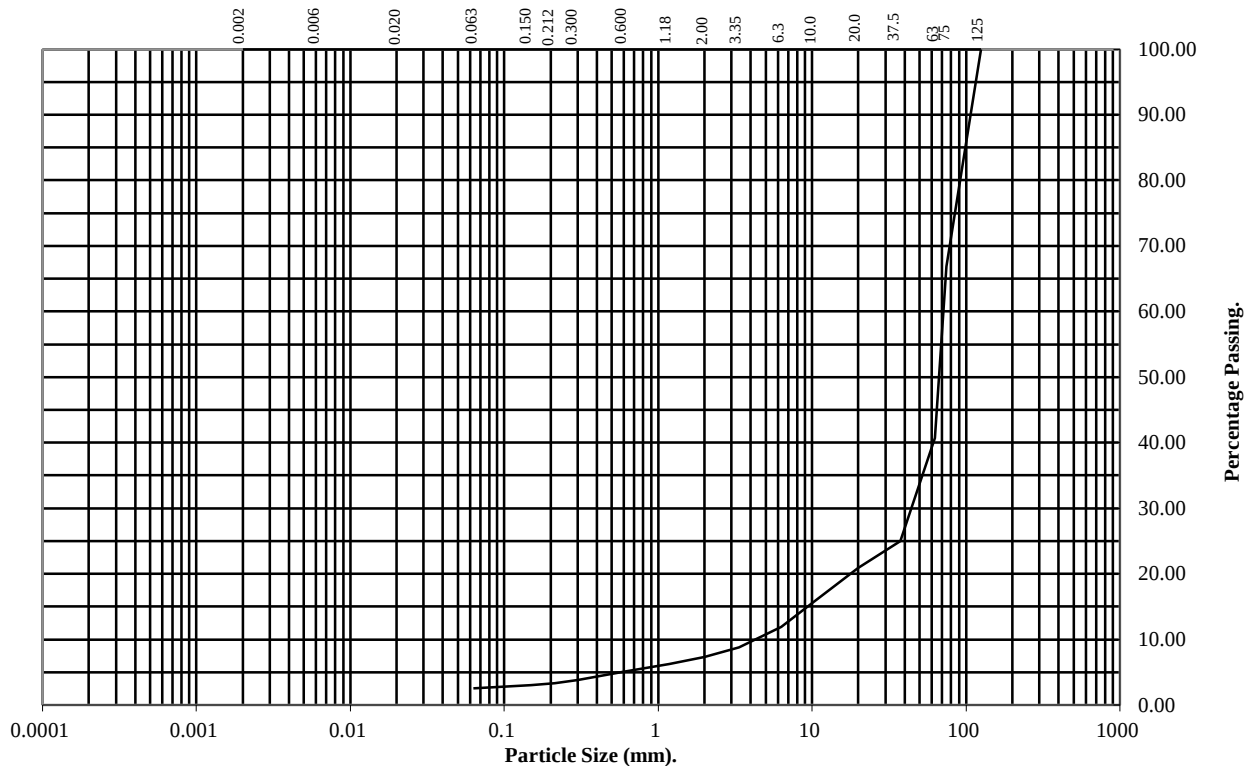
1.50

Sample Number:

Base Depth(m):

Sample Type:

B



BS Test Sieve (mm)	Percentage Passing
125	100
75	67
63	41
37.5	25
20	21
10	15
6.3	12
3.35	9
2	7
1.18	6
0.6	5
0.3	4
0.212	3
0.15	3
0.063	3

Soil Fraction	Total Percentage
Cobbles	59
Gravel	34
Sand	4
Silt/Clay	3

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

WBH104

Top Depth (m):

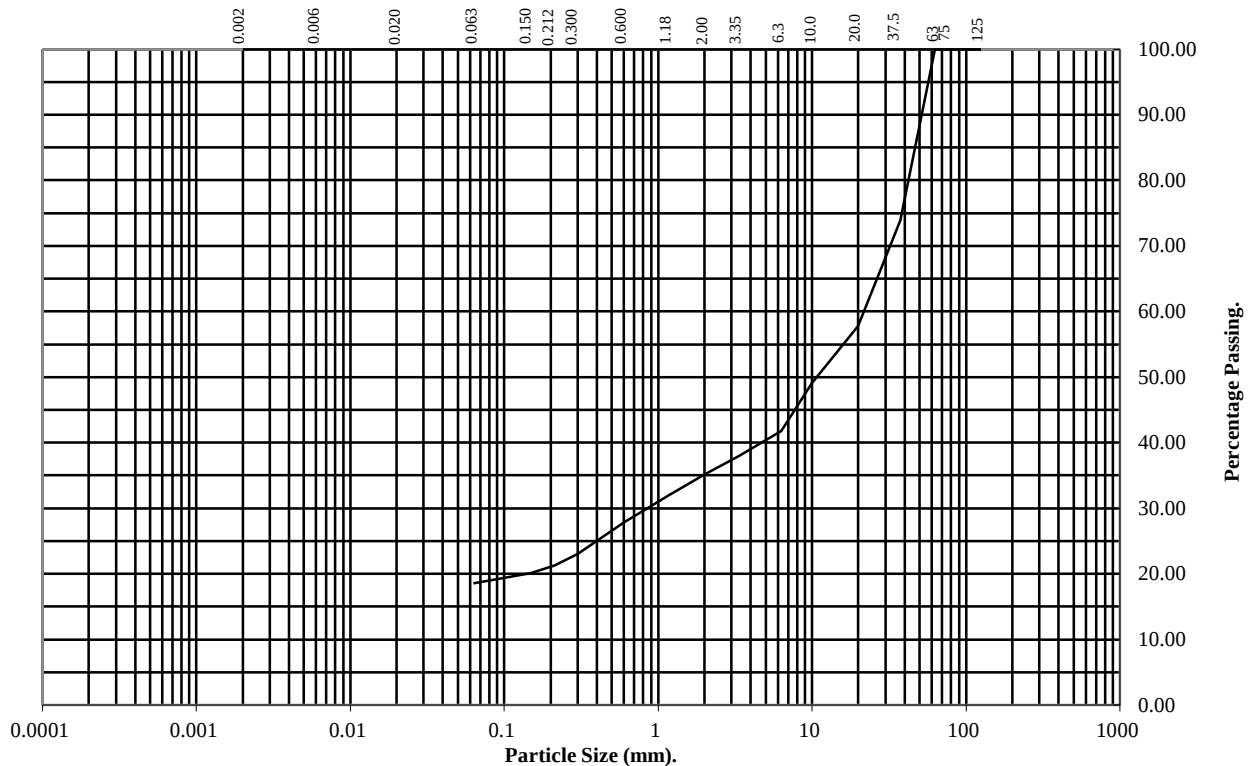
9.00

Sample Number:

Base Depth(m):

Sample Type:

B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	74
20	58
10	49
6.3	42
3.35	38
2	35
1.18	32
0.6	28
0.3	23
0.212	21
0.15	20
0.063	19

Soil Fraction	Total Percentage
Cobbles	0
Gravel	65
Sand	16
Silt/Clay	19

Remarks:

See Summary of Soil Descriptions



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

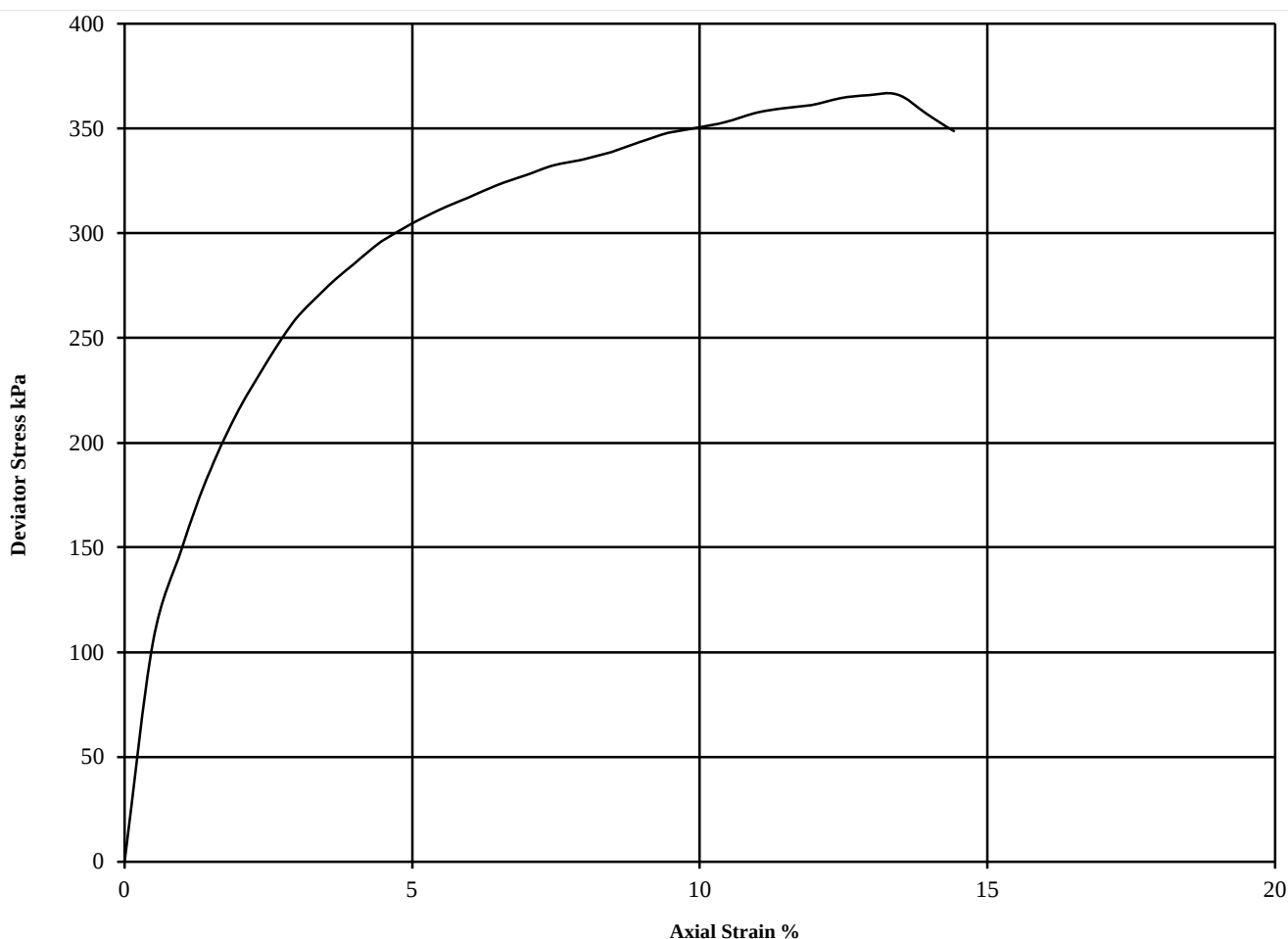
Hole Number: WBH104

Top Depth (m): 18.00

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34 See summary of soil descriptions
					$(\sigma_1 - \sigma_3)_f$	$\frac{1}{2}(\sigma_1 - \sigma_3)_f$			
1	26	1.98	1.57	360	366	183	13.4	Brittle	



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Client Ref:

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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

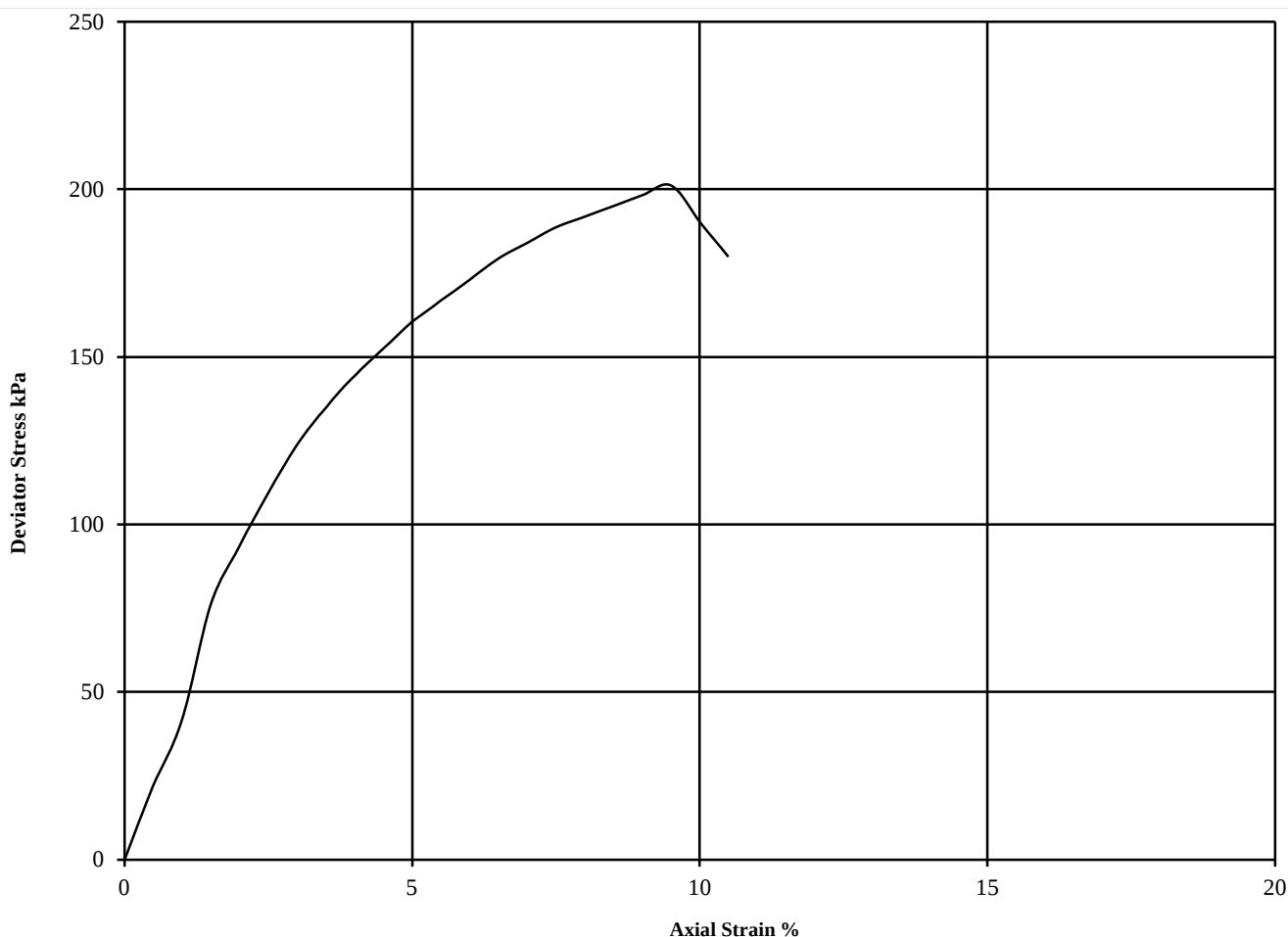
Hole Number: WBH104

Top Depth (m): 21.00

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		38	Height (mm):		76	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.87 See summary of soil descriptions
					$(\sigma_1 - \sigma_3)_f$	$\frac{1}{2}(\sigma_1 - \sigma_3)_f$			
1	28	1.79	1.40	420	201	101	9.5	Brittle	



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WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

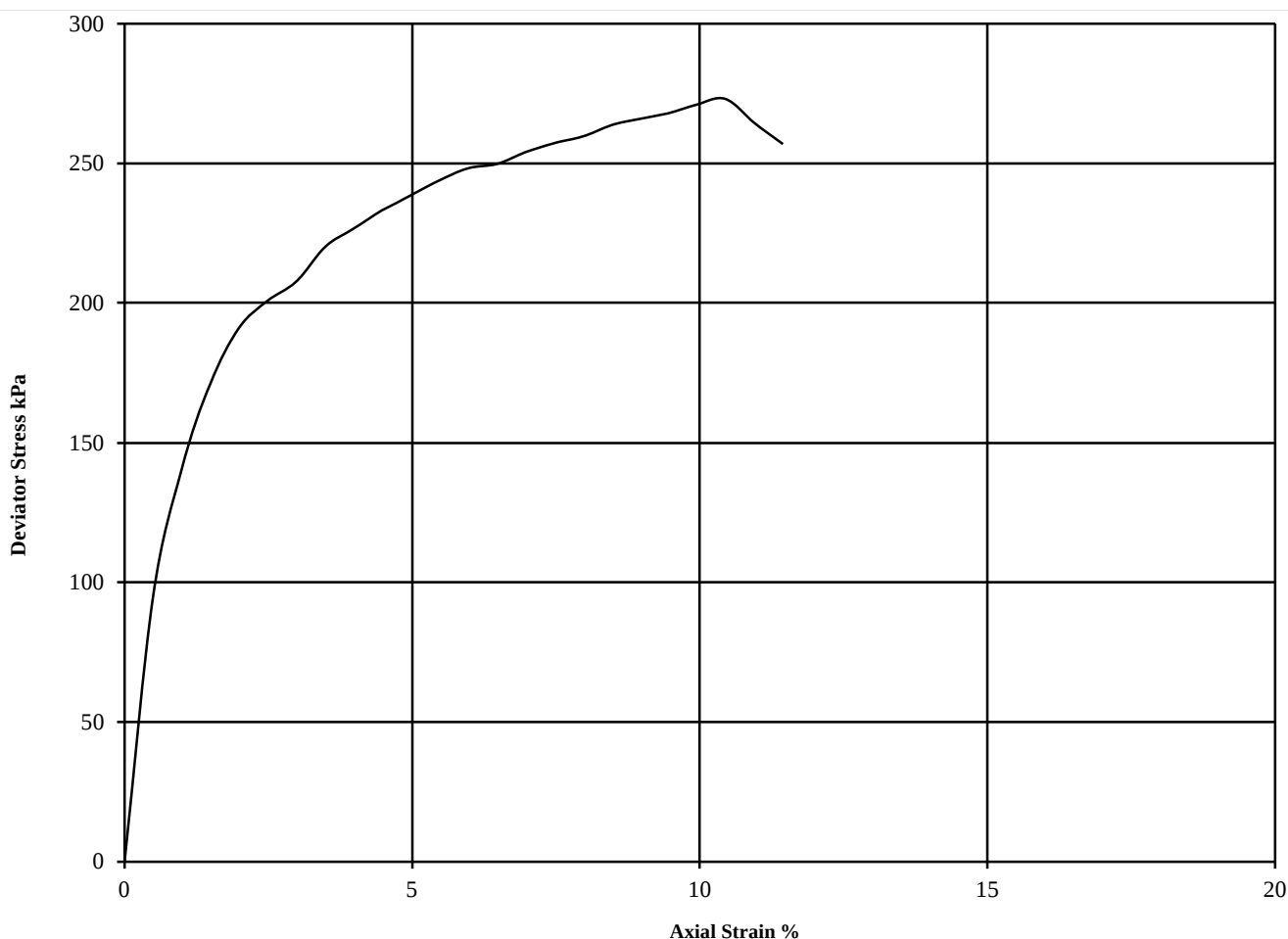
Hole Number: WBH104

Top Depth (m): 24.00

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.35 See summary of soil descriptions
					$\frac{1}{2}(\sigma_1 - \sigma_3)_f$	$\frac{1}{2}(\sigma_1 - \sigma_3)_f$			
1	31	1.92	1.46	480	273	137	10.4	Brittle	



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Contract No:

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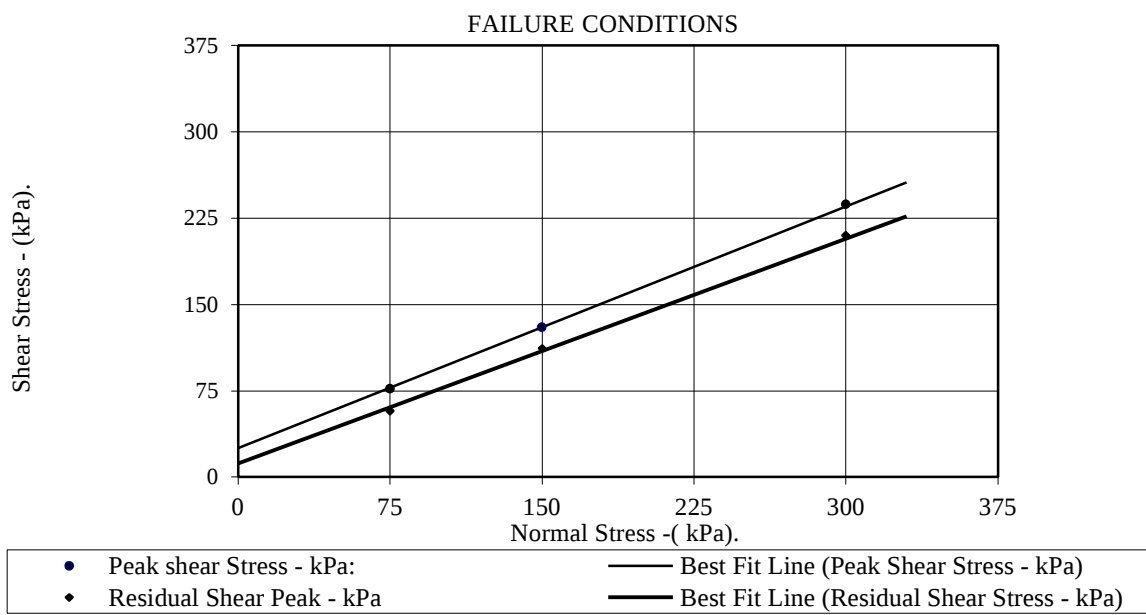
Client Ref:

WIE17469

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377 : 1990 Part 7 Clause 4

Hole Number:	WBH104		Top Depth	7.50	
Sample Number:			Base Depth		
Sample Conditions:	Submerged		Sample Type	B	
Particle Density - Mg/m3:	2.65	Assumed	Remarks:		
Specimen Preparation	Material tested passing 2mm sieve Remoulded using hand tamped effort				
Sample Description:	See summary of soil descriptions				
STAGE			1	2	3
Initial Conditions					
Height - mm:			19.99	19.99	19.99
Length - mm:			60.05	60.05	60.05
Moisture Content - %:			48	48	48
Bulk Density - Mg/m3:			1.69	1.69	1.69
Dry Density - Mg/m3:			1.14	1.14	1.14
Voids Ratio:			1.325	1.325	1.325
Normal Pressure- kPa			75	150	300
Consolidation Stage					
Consolidated Height - mm:			15.90	15.39	14.48
Peak Shear					
Rate of Strain - mm/min			0.047	0.047	0.047
Displacement at peak shear stress - mm			10.00	10.00	5.10
Peak shear Stress - kPa:			77	130	237
Residual Shear					
Rate of Strain - mm/min			0.094	0.094	0.094
Displacement at residual shear stress - mm			30.00	30.00	30.00
Residual shear Stress - kPa:			57	112	210
Final Consolidation Conditions					
Moisture Content - %:			34	31	28
Bulk Density - Mg/m3:			2.12	2.19	2.33
Dry Density - Mg/m3:			1.59	1.68	1.82
Peak Shear					
Angle of Shearing Resistance:(0)			35		
Effective Cohesion - kPa:			25		
Residual Shear					
Angle of Shearing Resistance:(0)			33		
Effective Cohesion - kPa:			12		



PSL
Professional Soils Laboratory

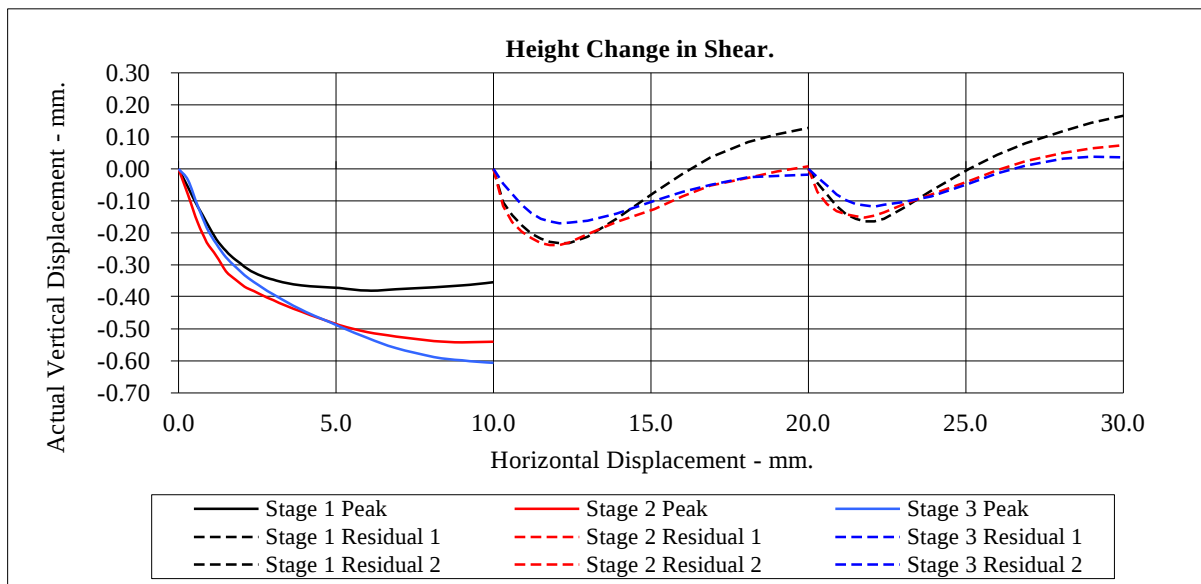
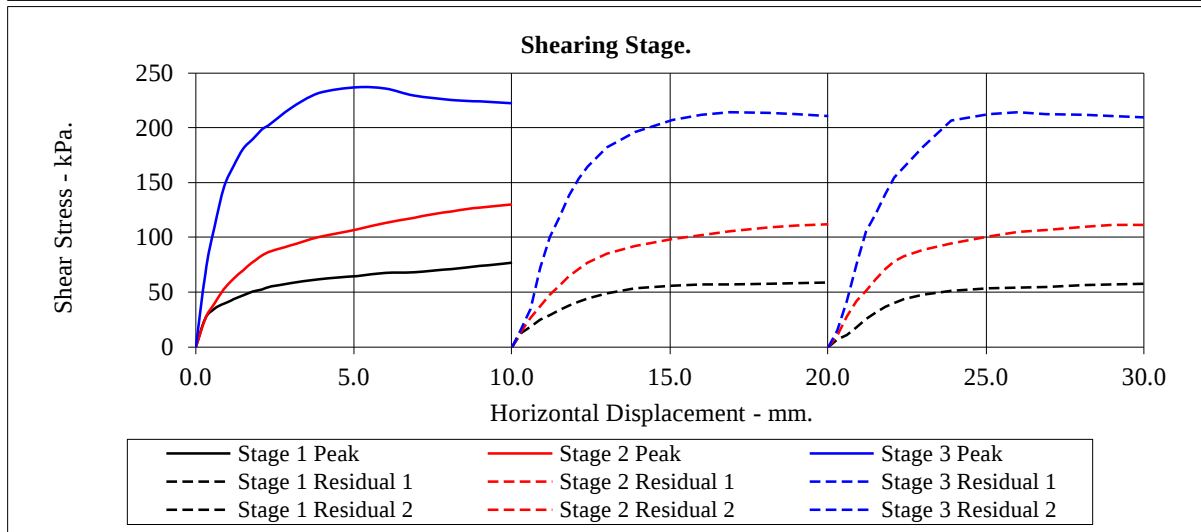
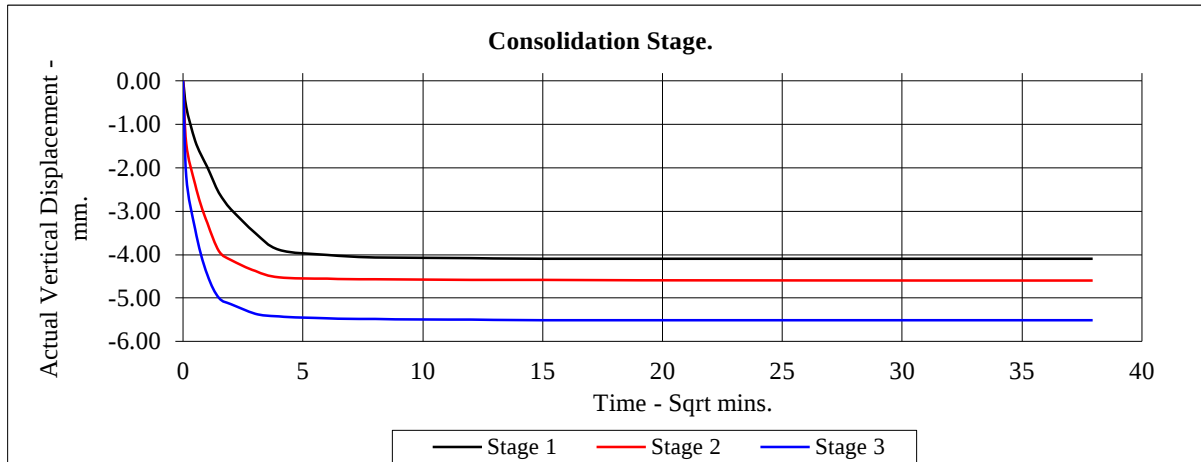
Project Otter

Contract No:
PSL22/7847
Client Ref:
WIE17469

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377 : 1990 Part 7 Clause 4

Hole Number:	WBH104	Top Depth:	7.50
Sample Number:		Base Depth:	



PSL
Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7847
Client Ref:
WIE17469



ANALYTICAL TEST REPORT

Contract no: 117338

Contract name: WIE17469: Project Otter

Client reference: PSL22/7847

Clients name: Professional Soils Laboratory

Clients address: 5/7 Hexthorpe Road
Doncaster
DN4 0AR

Samples received: 05 January 2023

Analysis started: 05 January 2023

Analysis completed: 12 January 2023

Report issued: 12 January 2023

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
\$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing

Approved by:



Abbie Neasham-Bourn
Senior Reporting Administrator

Chemtech Environmental Limited

SOILS

Lab number			117338-1	117338-2
Sample id			WBH104	WBH104
Depth (m)			2.50	13.50
Sample Type			B	B
Date sampled			-	-
Test	Method	Units		
pH	CE004 ^U	units	7.5	7.6
Magnesium (2:1 water soluble)	CE061	mg/l Mg	17	13
Chloride (2:1 water soluble)	CE049 ^U	mg/l Cl	71	71
Nitrate (2:1 water soluble)	CE049 ^U	mg/l NO ₃	1.3	1.3
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	1041	523
Sulphate (acid extractable)	CE062 ^U	mg/kg SO ₄	1438	1842
Sulphate (acid extractable)	CE062 ^U	% w/w SO ₄	0.14	0.18
Sulphur (total)	CE119	mg/kg S	3086	2383
Sulphur (total)	CE119	% w/w S	0.31	0.24
Total Organic Carbon (TOC)	CE197	% w/w C	-	9.4
Estimate of OMC (calculated from TOC)	CE197	% w/w	-	16.2

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	As received	U	-	units
CE061	Magnesium (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry		1	mg/l Mg
CE049	Chloride (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	1	mg/l Cl
CE049	Nitrate (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	1	mg/l NO ₃
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO ₄
CE062	Sulphate (acid extractable)	HCl extract, analysed by ICP-OES	Dry	U	100	mg/kg SO ₄
CE062	Sulphate (acid extractable)	HCl extract, analysed by ICP-OES	Dry	U	0.01	% w/w SO ₄
CE119	Sulphur (total)	Aqua regia digest, analysed by ICP-OES	Dry		100	mg/kg S
CE119	Sulphur (total)	Aqua regia digest, analysed by ICP-OES	Dry		0.01	% w/w S
CE197	Total Organic Carbon (TOC)	Carbon Analyser	Dry		0.1	% w/w C
CE197	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry		0.1	% w/w

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
117338-1	WBH104	2.50	Y	All (NSD)
117338-2	WBH104	13.50	Y	All (NSD)

Chemtech Environmental Limited

ADDITIONAL INFORMATION

Notes

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

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Samples will be disposed of 4 weeks from initial receipt unless otherwise instructed.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones, where applicable.



LABORATORY REPORT



4043

Contract Number: PSL22/7848

Report Date: 13 January 2023
Client's Reference: WIE17469-WBH105
Client Name: Groundtech Consulting
First Floor
Lloyd House
Orford Court
Greenfold Way
WN7 3XJ

For the attention of: Michael Berry

Contract Title: Project Otter

Date Received: 9/12/2022
Date Commenced: 9/12/2022

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)



L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

M Fennell
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
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e-mail: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

4043

PSL
Professional Soils Laboratory

Project Otter

Contract No:

PSL22/7848

Client Ref:

WIE17469

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



4043

PSL

Professional Soils Laboratory

Project Otter

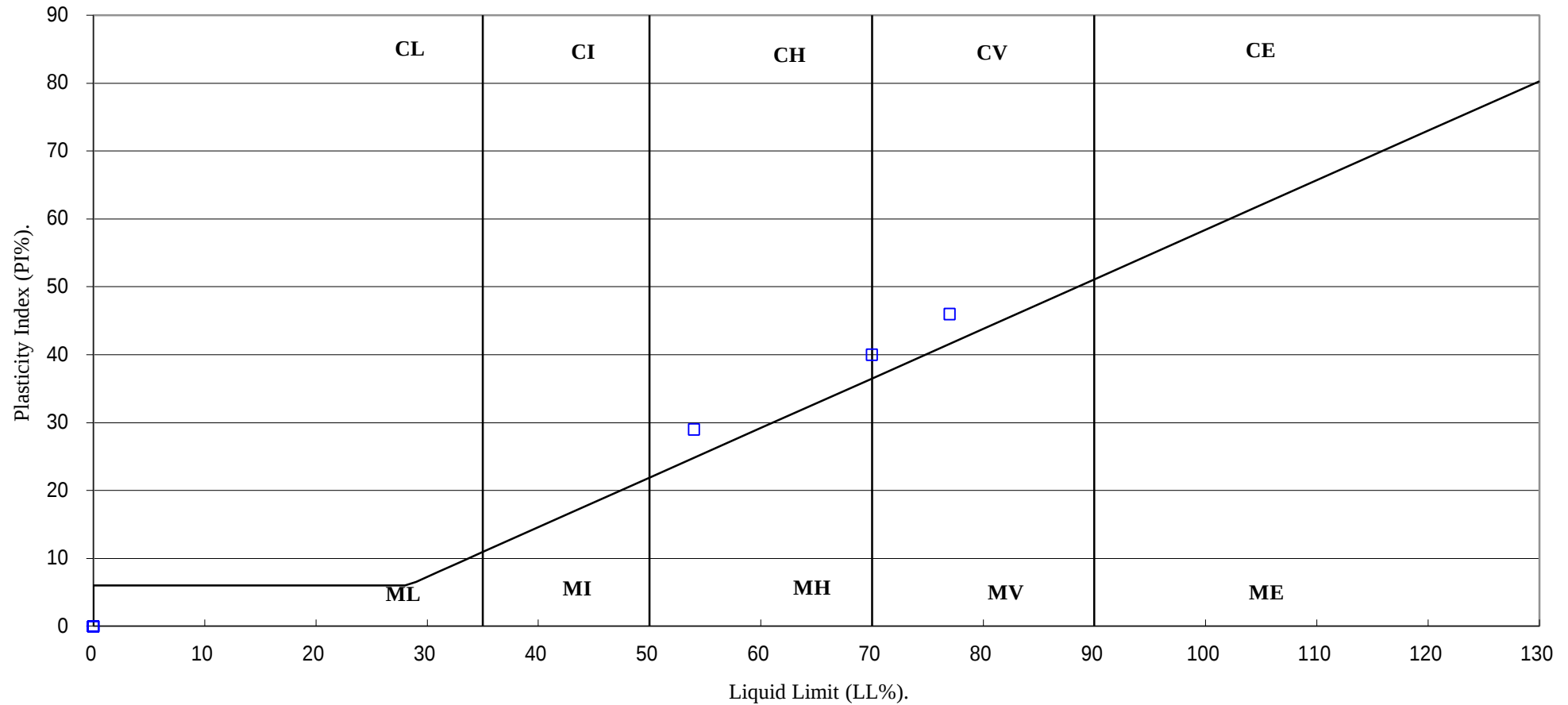
Contract No:

PSL22/7848

Client Ref:

WIE17469

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL

Professional Soils Laboratory

Project Otter

Contract No:

PSL22/7848

Client Ref:

WIE17469

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

WBH105

Top Depth (m):

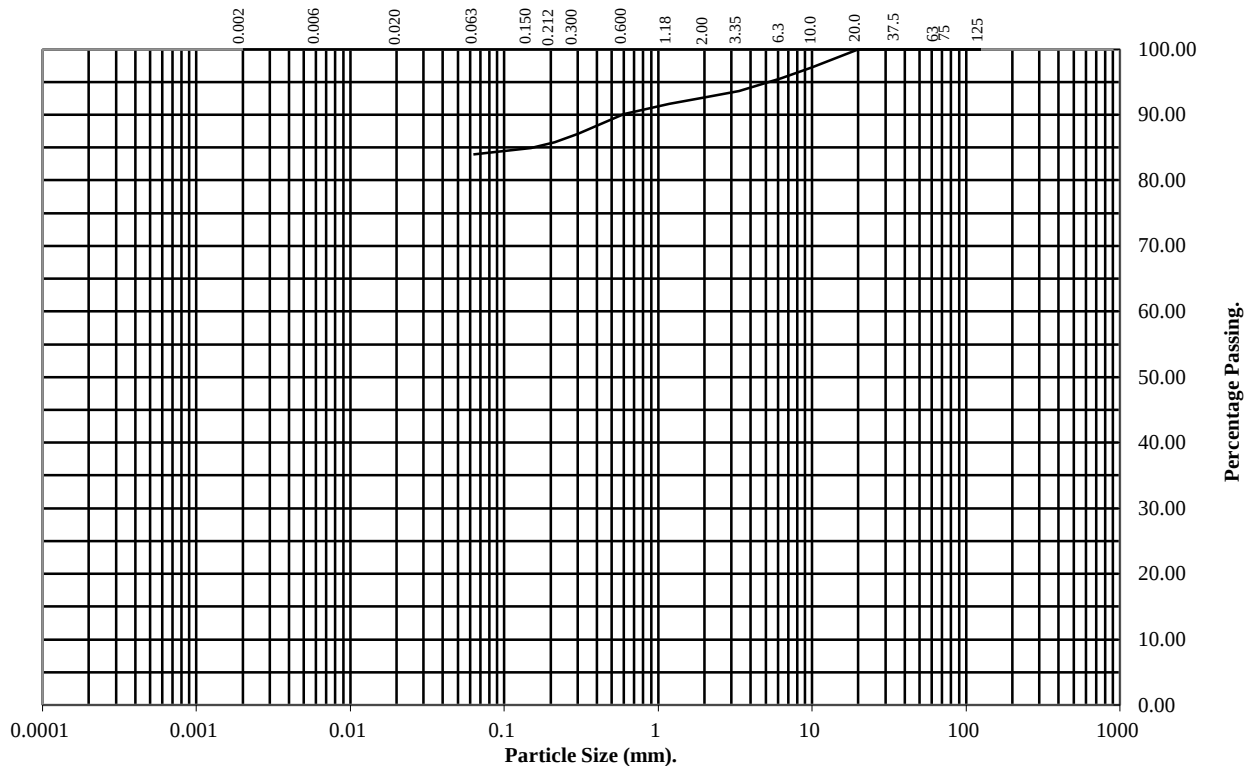
0.50

Sample Number:

Base Depth(m):

Sample Type:

B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	97
6.3	96
3.35	94
2	93
1.18	92
0.6	90
0.3	87
0.212	86
0.15	85
0.063	84

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	9
Silt/Clay	84

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7848
Client Ref:
WIE17469

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number:

WBH105

Top Depth (m):

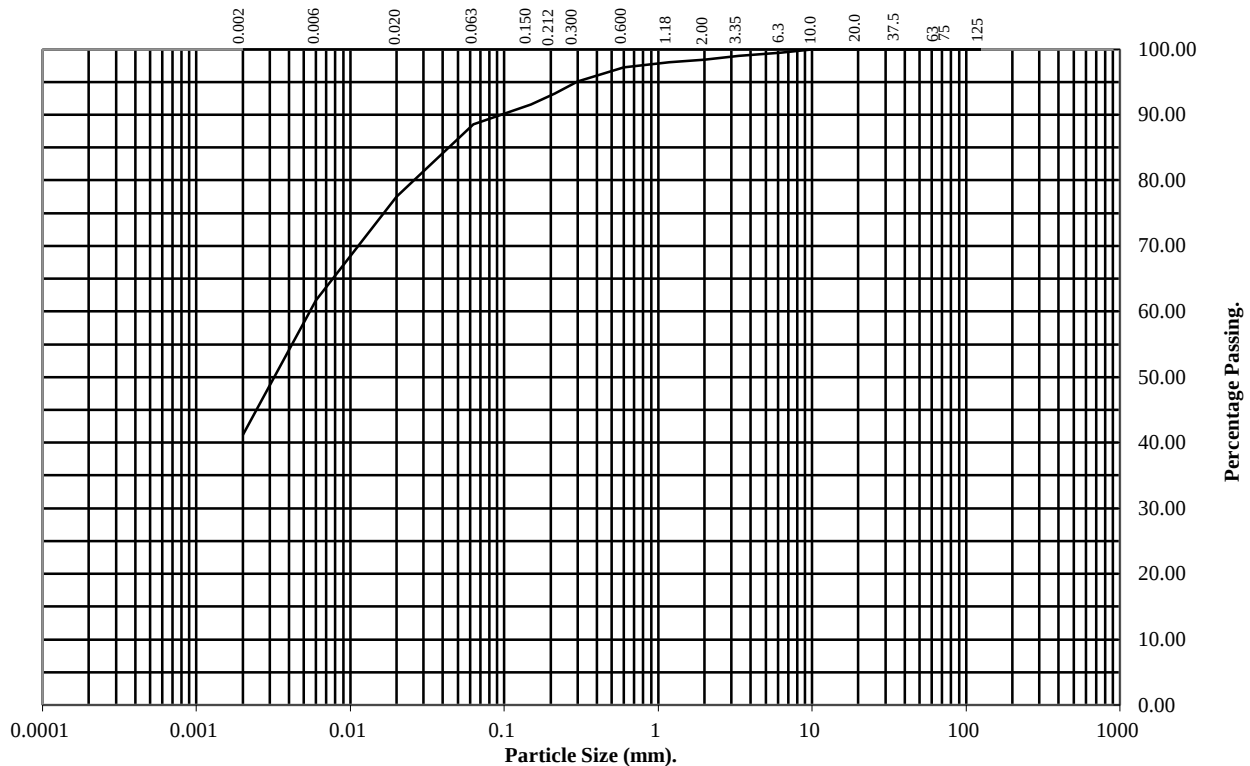
11.50

Sample Number:

Base Depth(m):

Sample Type:

B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	98
1.18	98
0.6	97
0.3	95
0.212	93
0.15	92
0.063	89

Particle Diameter	Percentage Passing
0.02	77
0.006	62
0.002	41

Soil Fraction	Total Percentage
Cobbles	0
Gravel	2
Sand	9
Silt	48
Clay	41

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7848
Client Ref:
WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: WBH105

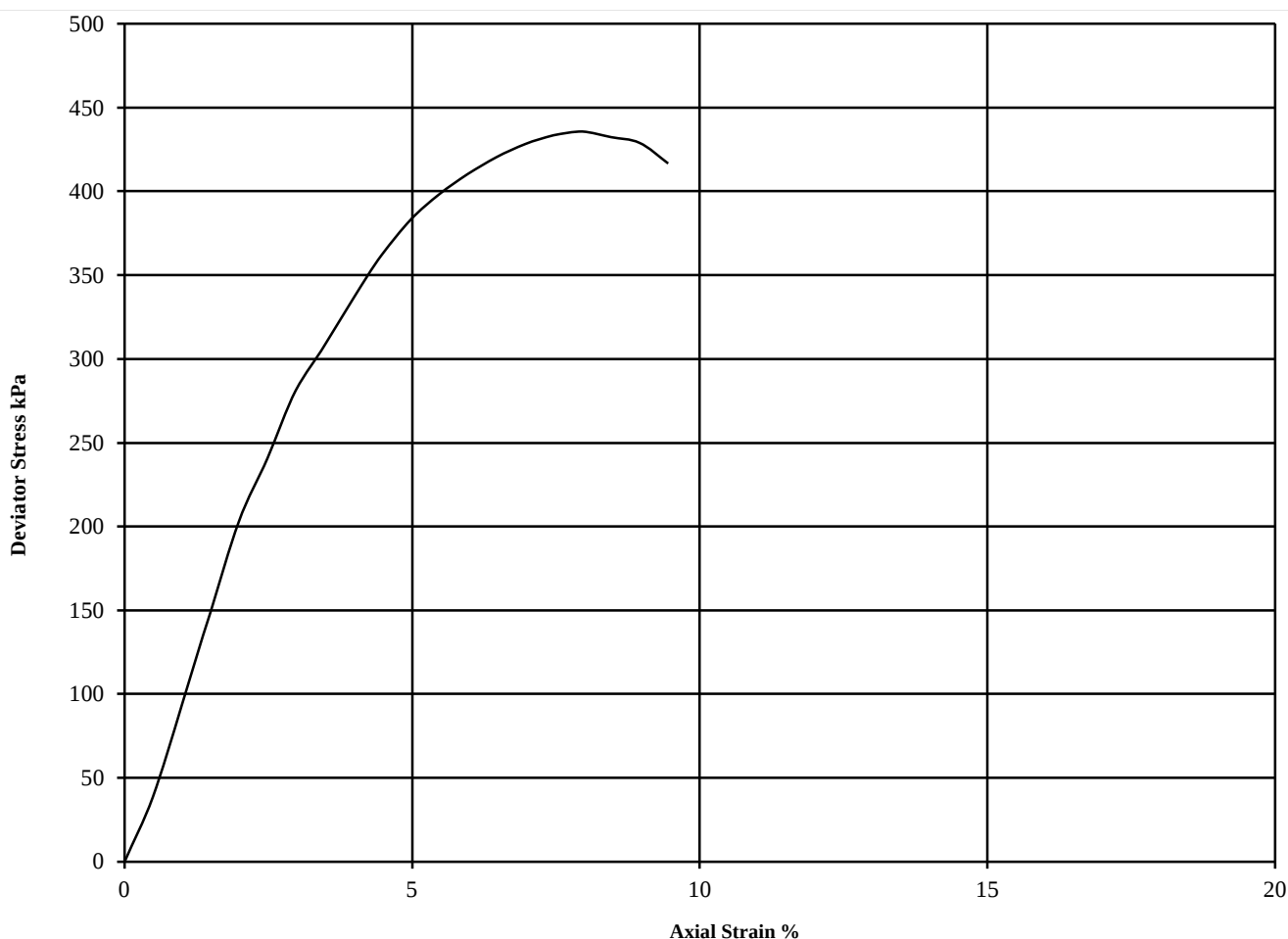
Top Depth (m): 15.00

Sample Number:

Base Depth (m):

Sample Type

U



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.35 See summary of soil descriptions
					$(\sigma_1 - \sigma_3)_f$	$\frac{1}{2}(\sigma_1 - \sigma_3)_f$			
1	26	1.93	1.53	300	436	218	8.0	Brittle	



4043

PSL

Professional Soils Laboratory

Project Otter

Contract No:

PSL22/7848

Client Ref:

WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

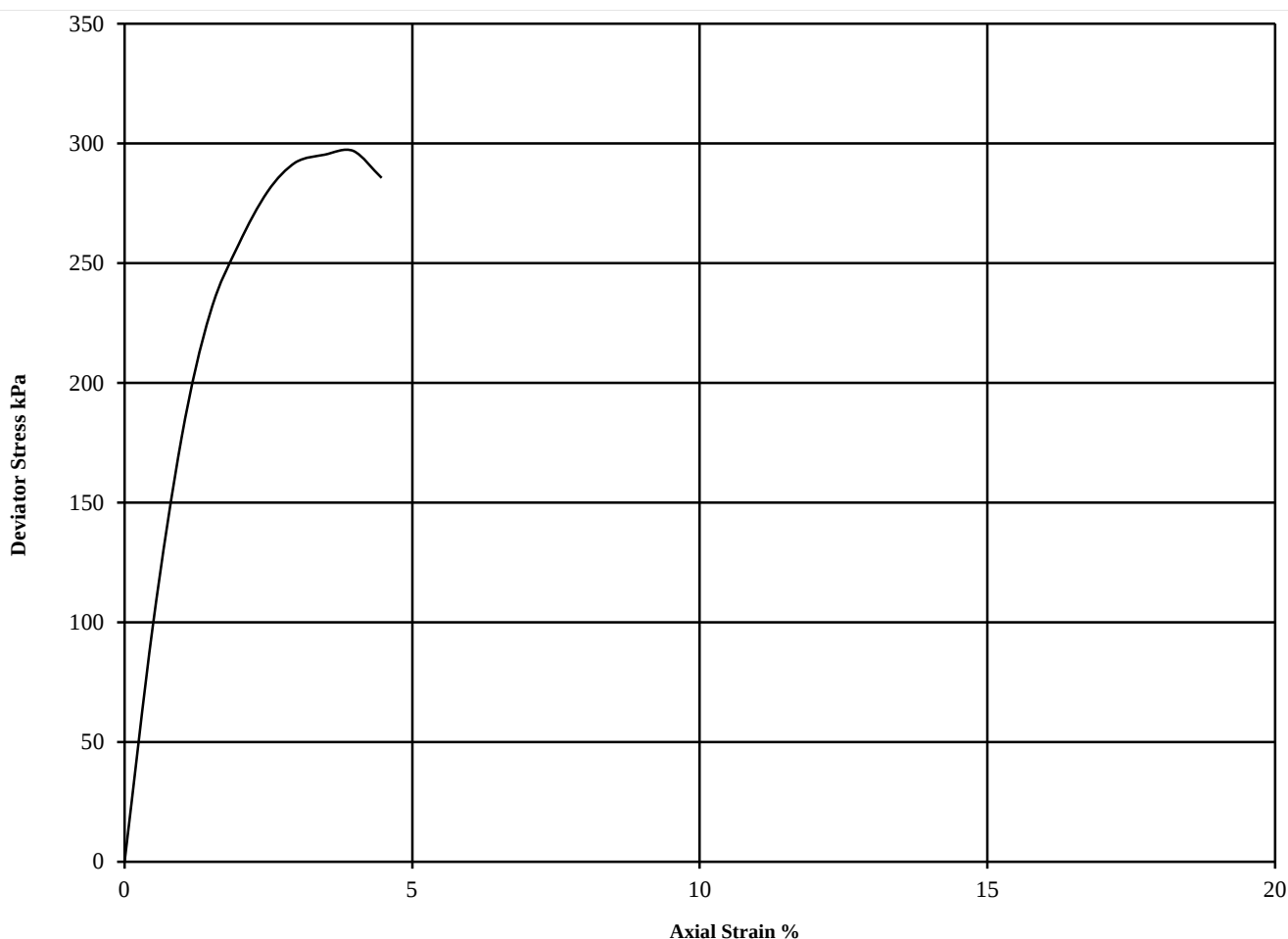
Hole Number: WBH105

Top Depth (m): 21.00

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36 See summary of soil descriptions
					$\frac{1}{2}(\sigma_1 - \sigma_3)_f$	$\frac{1}{2}(\sigma_1 - \sigma_3)_f$			
1	26	1.96	1.56	420	297	148	4.0	Brittle	



Project Otter

Contract No:

PSL22/7848

Client Ref:

WIE17469



ANALYTICAL TEST REPORT

Contract no: 117333

Contract name: WIE17469: Project Otter

Client reference: PSL22/7848

Clients name: Professional Soils Laboratory

Clients address: 5/7 Hexthorpe Road
Doncaster
DN4 0AR

Samples received: 05 January 2023

Analysis started: 05 January 2023

Analysis completed: 12 January 2023

Report issued: 12 January 2023

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
\$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing

Approved by:



Abbie Neasham-Bourn
Senior Reporting Administrator

Chemtech Environmental Limited

SOILS

Lab number			117333-1
Sample id			WBH105
Depth (m)			2.50
Sample Type			B
Date sampled			-
Test	Method	Units	
pH	CE004 ^U	units	7.6
Magnesium (2:1 water soluble)	CE061	mg/l Mg	44
Chloride (2:1 water soluble)	CE049 ^U	mg/l Cl	2689
Nitrate (2:1 water soluble)	CE049 ^U	mg/l NO ₃	1.2
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	2141
Sulphate (acid extractable)	CE062 ^U	mg/kg SO ₄	10215
Sulphate (acid extractable)	CE062 ^U	% w/w SO ₄	1.02
Sulphur (total)	CE119	mg/kg S	5311
Sulphur (total)	CE119	% w/w S	0.53
Total Organic Carbon (TOC)	CE197	% w/w C	5.4
Estimate of OMC (calculated from TOC)	CE197	% w/w	9.3

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	As received	U	-	units
CE061	Magnesium (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry		1	mg/l Mg
CE049	Chloride (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	1	mg/l Cl
CE049	Nitrate (2:1 water soluble)	Aqueous extraction, IC-COND	Dry	U	1	mg/l NO ₃
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO ₄
CE062	Sulphate (acid extractable)	HCl extract, analysed by ICP-OES	Dry	U	100	mg/kg SO ₄
CE062	Sulphate (acid extractable)	HCl extract, analysed by ICP-OES	Dry	U	0.01	% w/w SO ₄
CE119	Sulphur (total)	Aqua regia digest, analysed by ICP-OES	Dry		100	mg/kg S
CE119	Sulphur (total)	Aqua regia digest, analysed by ICP-OES	Dry		0.01	% w/w S
CE197	Total Organic Carbon (TOC)	Carbon Analyser	Dry		0.1	% w/w C
CE197	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry		0.1	% w/w

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
117333-1	WBH105	2.50	Y	All (NSD)

Chemtech Environmental Limited

ADDITIONAL INFORMATION

Notes

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

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Samples will be disposed of 4 weeks from initial receipt unless otherwise instructed.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones, where applicable.



LABORATORY REPORT



4043

Contract Number: PSL22/7849

Report Date: 06 January 2023
Client's Reference: WIE17469-WBH106
Client Name: Groundtech Consulting
First Floor
Lloyd House
Orford Court
Greenfold Way
WN7 3XJ

For the attention of: Michael Berry

Contract Title: Project Otter

Date Received: 9/12/2022
Date Commenced: 9/12/2022
Date Completed: 6/1/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

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awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

4043

PSL
Professional Soils Laboratory

Project Otter

Contract No:

PSL22/7849

Client Ref:

WIE17469

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

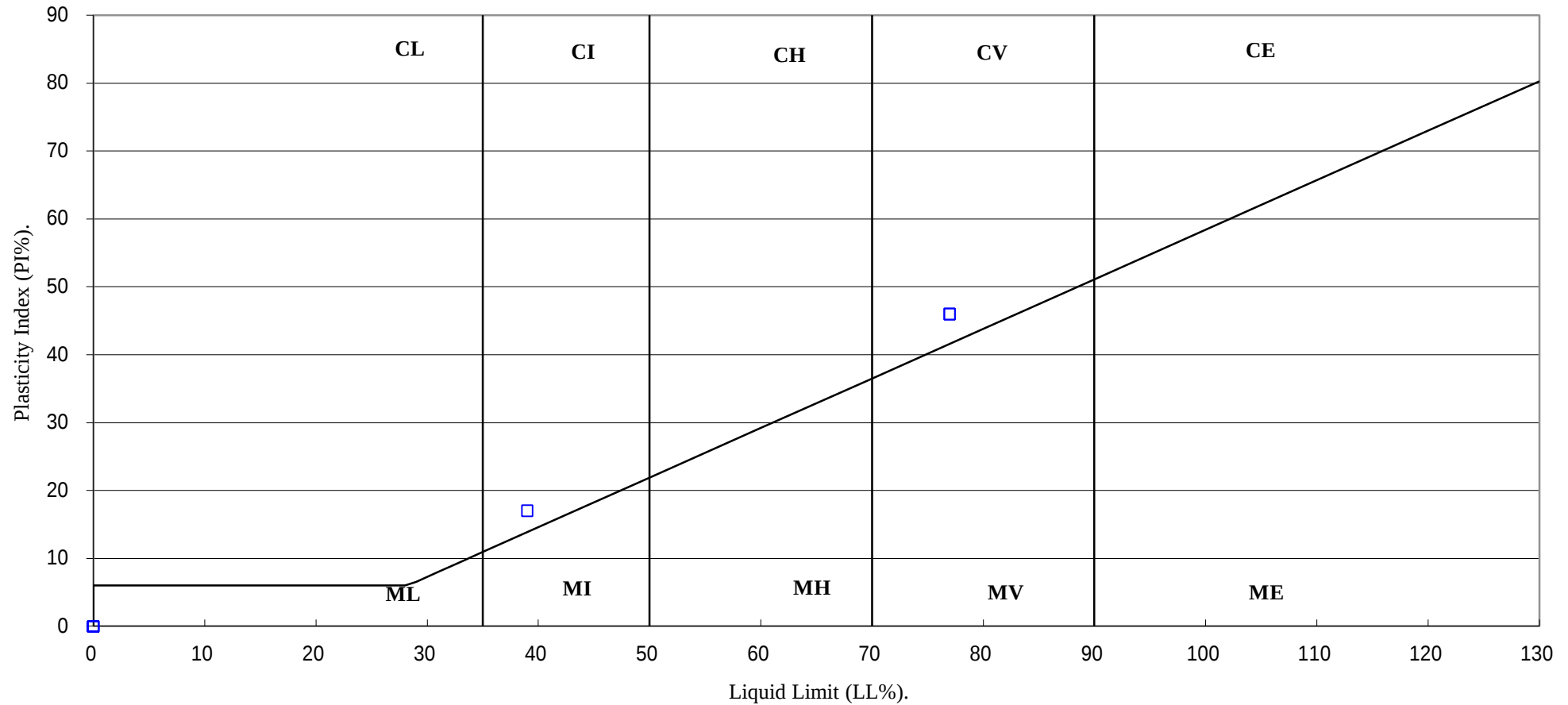
Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m ³ Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WBH106		D	1.20		33							
WBH106		D	2.50		20			39	22	17	100	Intermediate Plasticity CI
WBH106		D	7.00		28							
WBH106		D	17.00		27			77	31	46	100	Very High Plasticity CV
WBH106		D	23.00		27			77	31	46	100	Very High Plasticity CV

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

 4043		Project Otter	Contract No:
			PSL22/7849
			Client Ref:
			WIE17469

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL

Professional Soils Laboratory

Project Otter

Contract No:

PSL22/7849

Client Ref:

WIE17469

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

WBH106

Top Depth (m):

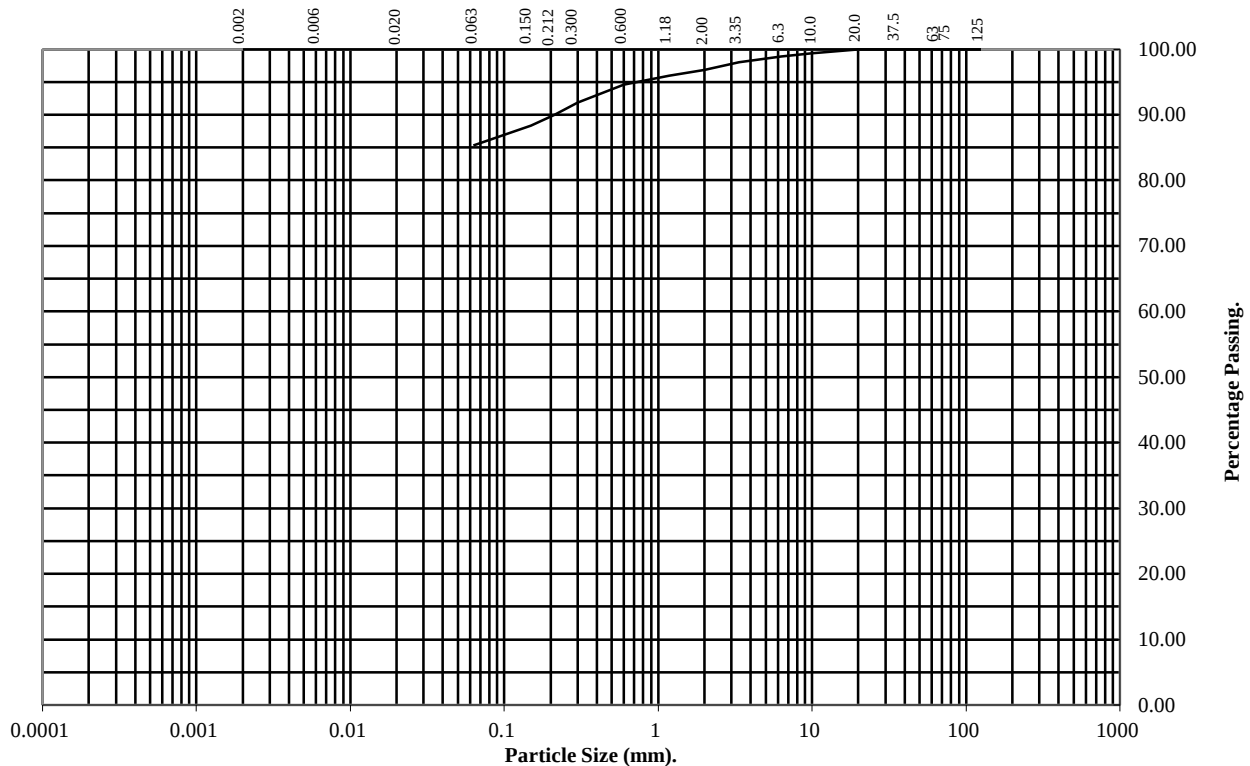
1.20

Sample Number:

Base Depth(m):

Sample Type:

D



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	99
3.35	98
2	97
1.18	96
0.6	95
0.3	92
0.212	90
0.15	88
0.063	85

Soil Fraction	Total Percentage
Cobbles	0
Gravel	3
Sand	12
Silt/Clay	85

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7849
Client Ref:
WIE17469

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number:

WBH106

Top Depth (m):

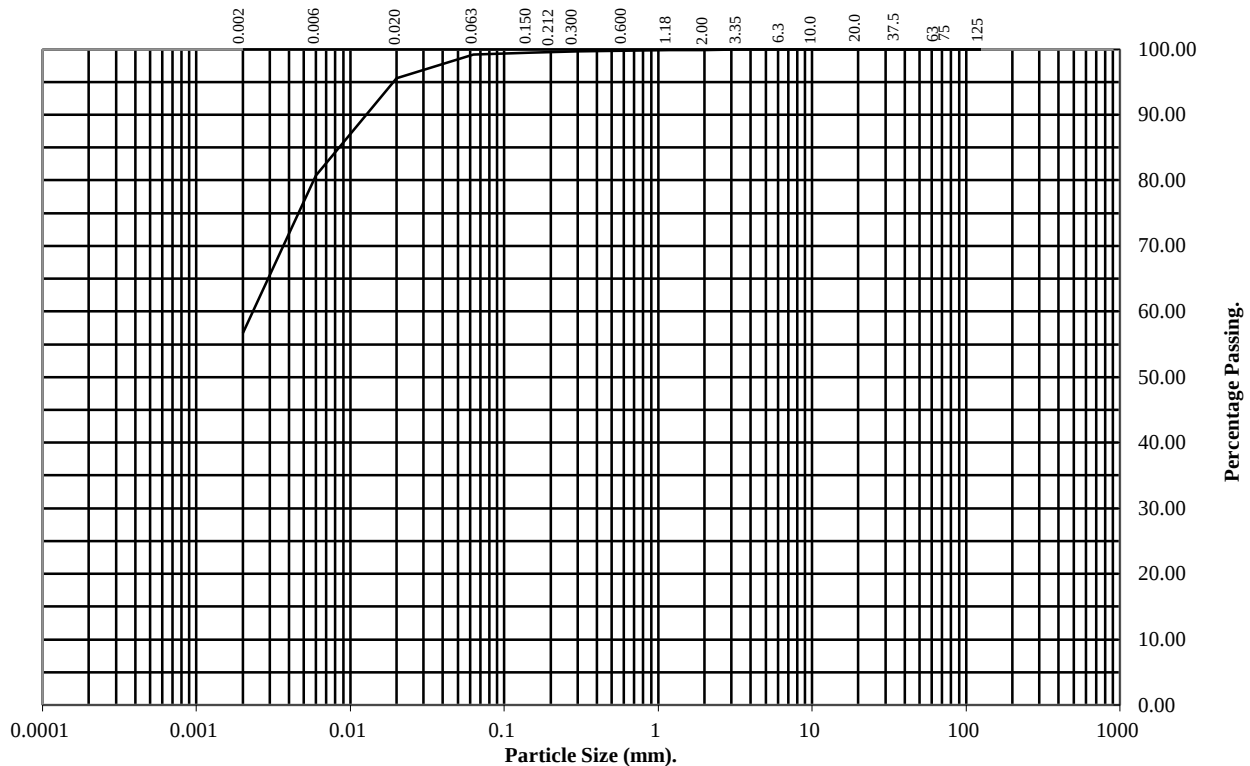
16.00

Sample Number:

Base Depth(m):

Sample Type:

D



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	100
0.212	100
0.15	99
0.063	99

Particle Diameter	Percentage Passing
0.02	96
0.006	81
0.002	57

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	1
Silt	42
Clay	57

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Project Otter

Contract No:
PSL22/7849
Client Ref:
WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

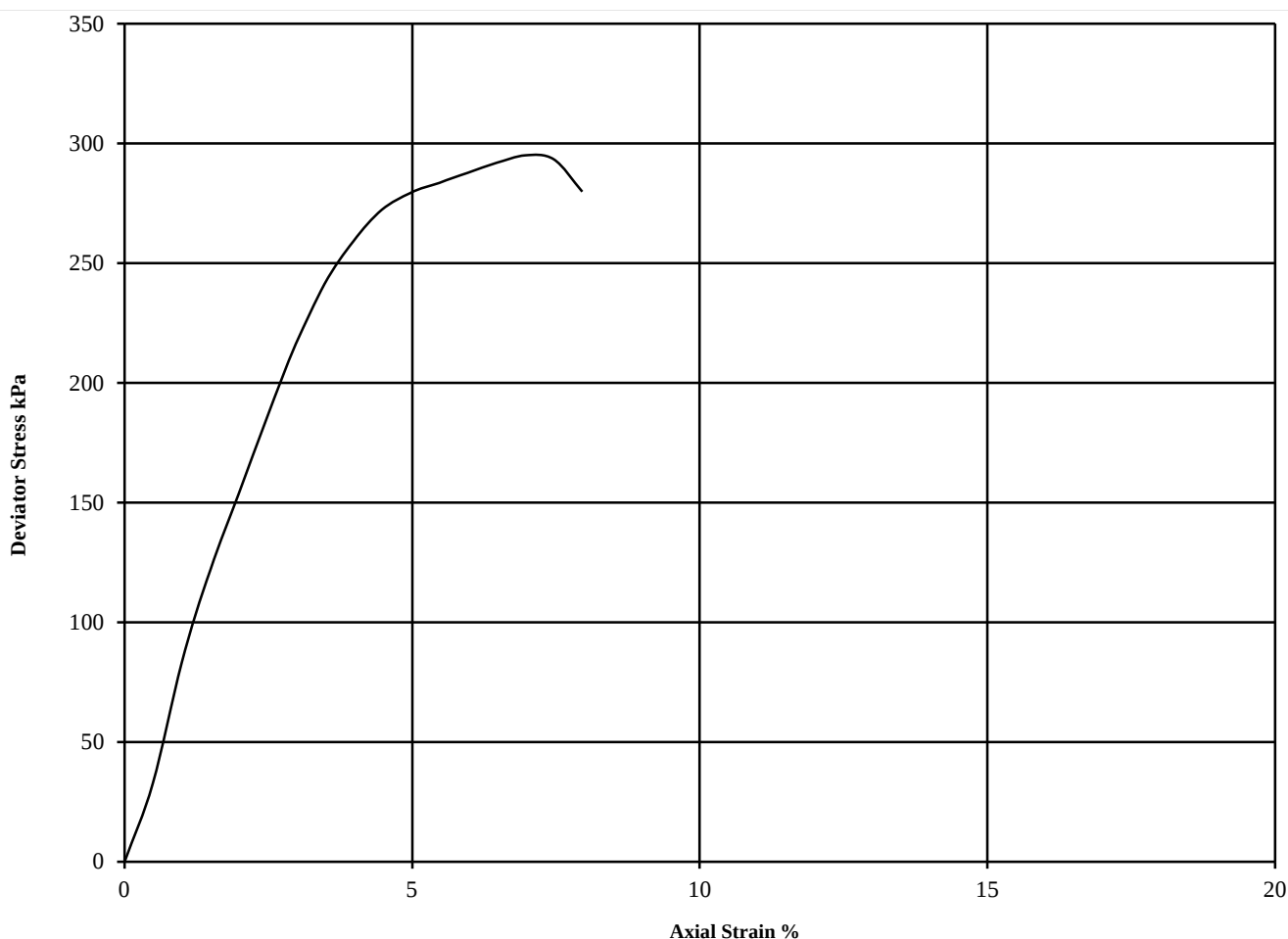
Hole Number: WBH106

Top Depth (m): 7.50

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36 See summary of soil descriptions
				3	$(\sigma_1 - \sigma_3)_f$	$\frac{1}{2}(\sigma_1 - \sigma_3)_f$			
1	27	1.94	1.52	150	295	147	7.0	Brittle	



4043

PSL

Professional Soils Laboratory

Project Otter

Contract No:

PSL22/7849

Client Ref:

WIE17469

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

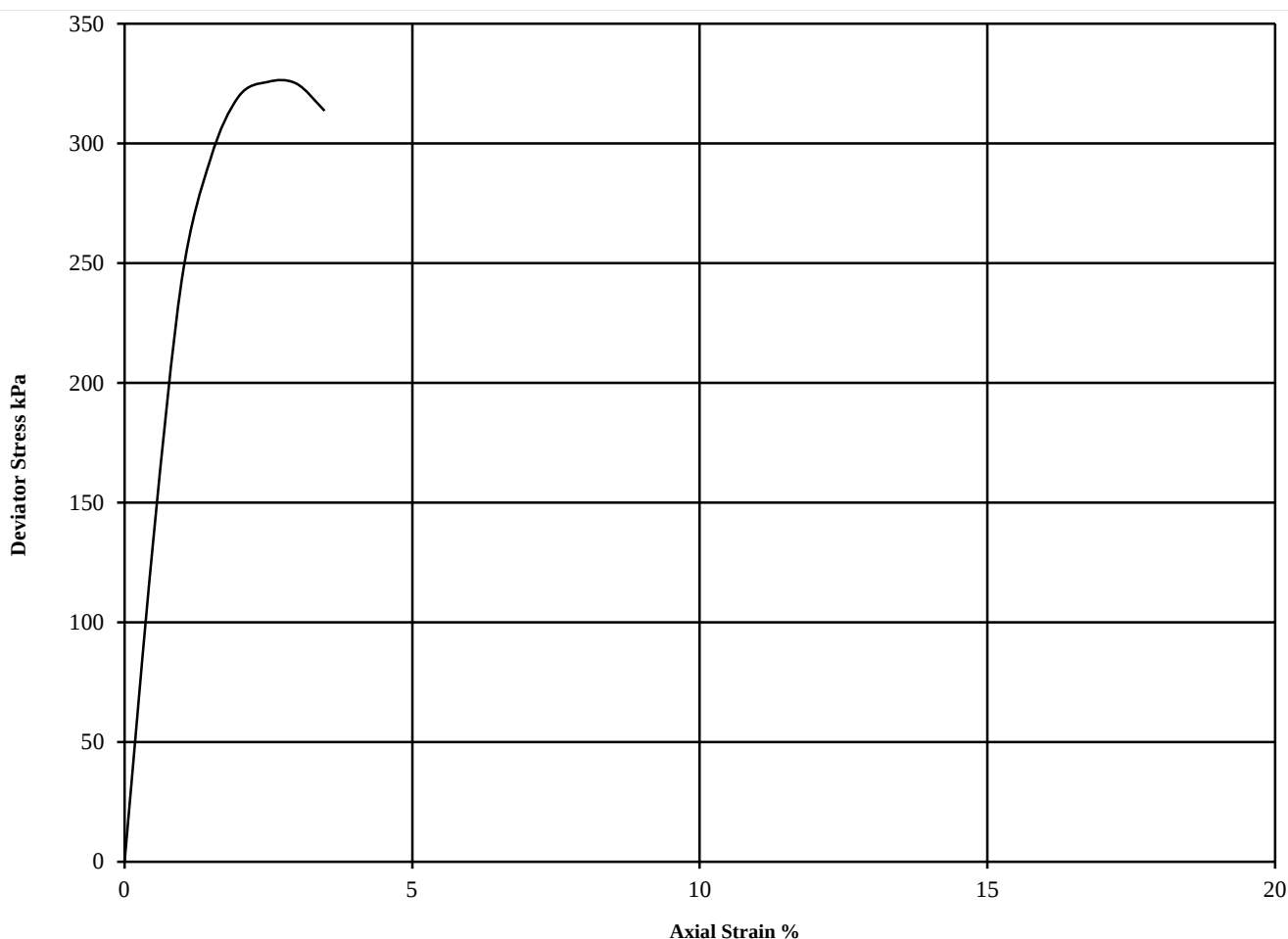
Hole Number: WBH106

Top Depth (m): 22.50

Sample Number:

Base Depth (m):

Sample Type U



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36 See summary of soil descriptions
					$(\sigma_1 - \sigma_3)_f$	$\frac{1}{2}(\sigma_1 - \sigma_3)_f$			
1	26	1.92	1.52	450	326	163	2.5	Brittle	



Project Otter

Contract No:

PSL22/7849

Client Ref:

WIE17469

ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: WBH106

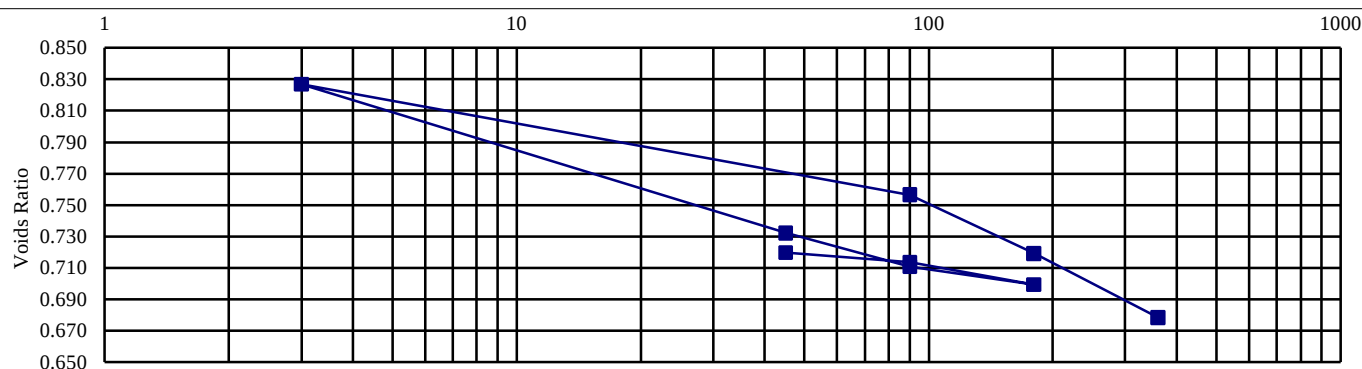
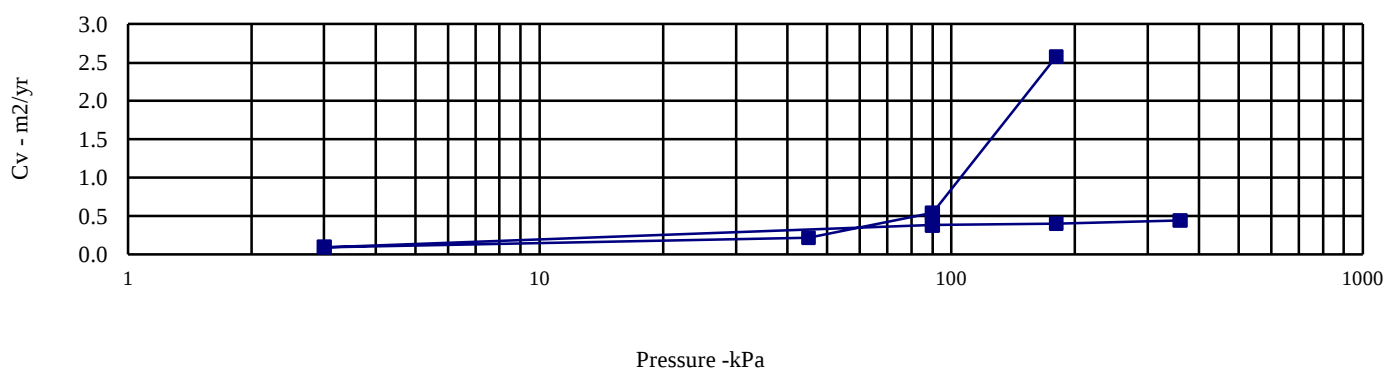
Top Depth (m): 4.50

Sample Number:

Base Depth (m) :

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	28	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	1.95	0	45	Swelling	Swelling	Method used to	
Dry Density (Mg/m3):	1.52	45	90	Swelling	Swelling	determine CV:	T90
Voids Ratio:	0.740	90	180	0.092	2.582	Nominal temperature	
Degree of saturation:	100.4	180	90	0.075	0.547	during test ' C:	20
Height (mm):	20.002	90	45	0.276	0.219	Remarks: See summary of soil descriptions	
Diameter (mm)	75.02	45	3	1.302	0.095		
Particle Density (Mg/m3):	2.65	4	90	0.447	0.382		
Assumed		90	180	0.236	0.404		
		180	360	0.132	0.442		



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