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23rd August 2021

ref: A11609/210809/L1

Vistry Southern
Central 40
Lime Tree Way
Chineham Park
Basingstoke
RG24 8GU

By Email: Zoe.Dennis@vistry.co.uk

Dear Zoe,

RE: Treetops Nurseries, Allington Way, Fair Oak, SO50 7QD – Geotechnical Ground Investigation

1.0 Background

It is understood that Vistry Southern are proposing to develop the site at Treetops Nurseries, Fair Oak, SO50 7QD from its current use as a former horticultural nursery with a small holding, to a 34no. residential properties, comprising a mixture of semi-detached, terrace and detached houses, with associated private gardens soft landscaping and infrastructure as set out in the proposed layout provided by OSP Architects, drawing reference 20031/C101A. A proposed layout is also presented in Figure 2.0 in Appendix 1.

The site has been subject to a previous phase of investigation by Omnia in November 2020 as set out in the report reference A11463/1.0 (Phase I-II, Geo-environmental Site Assessment). The report gave a geotechnical assessment for shallow foundations between 1.00-3.00m below existing ground level, which gave allowable bearing capacities of 50-100kN/m² for 1.00-2.00m bgl rising to 100-200kN/m² at 3.00m bgl, with shallow groundwater at approximately 1.00m bgl. The report concluded that where the bearing capacities set out are insufficient for proposed loads then an alternative foundation solution, such as piles, should be considered. The client informed Omnia that the bearing capacities set out in the previous report were insufficient. Therefore, it was necessary that further ground investigation would be required to prove competency of the ground conditions to a sufficient depth to aid pile design.

2.0 Site works

Site investigation works were undertaken by Omnia on the 28th June to the 9th July 2021 and comprised the advancement of five (5no.) cable percussive boreholes in client specified locations across the site. Initially three (3no.) cable percussive boreholes were scoped for, however the client subsequently requested two (2no.) additional boreholes to maximise site coverage on the 25th May 2021. The scope of works is set out in Omnia fee proposal A11609/210504/L2 dated 25th May 2021.

The boreholes were logged to BS 5930:2015+A1(2020). A borehole location plan is presented in Appendix 1.

3.0 Site Description

The area of investigation was located in the southeast of Fair Oak on an approximately rectangular shaped parcel of land approximately 1.24ha in size. The site was accessed via Allington Lane to the northwest of the site.

At the time of the site investigation the northern parcel of the site comprised a former residential house, now utilised as a site office, with a site compound comprising 3no. metal shipping containers. Adjacent to the northeast boundary of the site was a single storey metal structure which is understood to have been a greenhouse associated with the former horticultural nursery.

Adjacent to the northwest boundary of the site was a single storey wooden and metal framed barn with a sheet metal roof. At the time of site visit a boat and stockpile of wooden pallets were noted towards the southeast of the residential property.

To the south and southeast, the site comprised an open grass field. The site was bounded by a hedgerow including semi mature and mature trees to the south and southeast, an active construction site to the southwest and northwest and residential houses to the northeast.

Towards the southeast the site comprised a large open grass field bounded by hedgerows, mature and semi-mature trees. The northern parcel of the site was primarily flat with a gentle slope noted towards the south of the site.

A selection of site photographs is presented in Appendix 4.

4.0 Ground Conditions

The ground conditions encountered during the intrusive site investigation are detailed in exploratory borehole logs presented within Appendix 2 and generally confirmed BGC Geology Map Sheet (Sheet 315, Southampton, Sold and Drift Edition at a scale of 1:50, 000).

Ground conditions on site comprised Made Ground and Topsoil directly underlain by bedrock deposits of the Wittering Formation. The base of the Wittering Formation was not encountered during the site investigation. Ground conditions encountered during the current phase of investigation generally confirmed that within the previous Omnia Report (A11463/1.0 dated November 2020).

Ground conditions are detailed below.

4.1 Made Ground

Made Ground was encountered within CP103-CP105 and was generally between 0.40-0.50m thick (CP103 and CP104, respectively), to the centre and west of the site, Made Ground had a maximum thickness of 3.00m (CP105) to the northeast of the site.

Within CP103 and CP104 a concrete slab was underlain by a soft brown, slightly gravelly CLAY. Sand is fine to medium. Gravel is fine subangular flint, brick and occasional concrete.

Within CP105 Made Ground comprised multiple horizons of mixed strata detailed below:

- Fine to cobble size angular to subangular GRAVEL of brick, tile, plastic, broken asphalt and concrete.
- Dark brown slight silty, sandy angular to subangular fine to cobble seized GRAVEL of brick, concrete, glass, asphalt. Sand is fine to coarse.
- Yellowish light brown, gravelly fine SAND. Gravel is fine subangular flint.

- Soft to firm, orange mottled grey, oxidised red, slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is fine angular brick.

It was noted that the location of CP105 was previously used as car parking for the smallholding.

4.2 Topsoil

Topsoil was encountered within CP101 and CP102 with a thickness of 0.40m and 0.50m, respectively, located to the southeast of the site. Topsoil comprised grass cover over light brown, slightly sandy, gravelly SILT (CP101) and dark brown slightly gravelly clayey fine SAND (CP102). Sand is fine. Gravel is fine to medium, subangular to subrounded flint and chalk.

4.3 Wittering Formation

The Topsoil and Made Ground was directly underlain by the Wittering Formation, which comprised a clay over sand. Typically, the bedrock deposits comprised the following, from near surface:

Clay was encountered from a minimum of 0.40m (CP101 and CP103) to a maximum of 10.00m bgl (CP101), with a typical base depth of 5.00-6.00m bgl. Clay comprised:

- Orange mottled grey and red, slightly sandy CLAY. Sand is fine to coarse.
- A soft to firm, strength increasing with depth to firm to stiff, dark grey and purply black sandy to very sandy CLAY.

Very dense sand was encountered from a minimum of 5.00m bgl (CP102 and CP105) to a maximum of 10.00m bgl (CP101). The base of the sand deposits of the Wittering Formation was not encountered during ground investigation. Sand comprised:

- Dark grey, clayey, variably clayey, fine to coarse SAND.
- Light brown and yellow, fine to coarse SAND.

The table below summarises the top and base depths of the clay and sand deposits of the formation.

Table 4-1 Summary of Wittering Formation

Location	Fine-grained Wittering Formation		Coarse-grained Wittering Formation	
	Top (m bgl)	Base (m bgl)	Top (m bgl)	Base (m bgl)
CP101	0.40	7.30	7.30	>15.20
CP102	0.50	7.20	7.20	>19.50
CP103	0.40	7.20	7.20	>18.00
CP104	0.50	5.80	5.80	>22.50
CP105	3.00	7.10	7.10	>18.00

The anticipated depth of the boreholes was initially to 25.00m bgl, as set out in fee proposal A11609/210504/L1, however boreholes were terminated at shallower depths, 15.20m (CP101) to 22.20m (CP104) as shown in Table 4-1, due to very dense sands at depth and blowing sands, where groundwater was encountered and drilling was unable to progress through.

Contact was made with the client on 29/06/2021 for confirmation that terminating the borehole at shallower depth due to dense ground conditions would still provide sufficient data for the structural engineers to progress with pile design. A response was issued via email on 29/06/2021 confirming that shallower termination of subsequent boreholes due to inherent ground conditions was agreed.

4.4 Groundwater conditions

Groundwater was encountered in all borehole positions as summarised below:

Table 4-2 Summary of groundwater conditions

Location	Depth of strike (m bgl)	Standing depth (m bgl) (After 20 minutes)	Water inflow comments
CP101	5.10	2.50	Fast
CP102	1.00	0.80	Medium
	7.20	6.70	Medium
CP103	7.20	6.20	Medium
CP104	5.80	5.10	Medium
CP105	7.10	6.00	Medium

5.0 Laboratory Analysis

Geotechnical laboratory analysis was undertaken by Professional Soils Limited who are a UKAS accredited laboratory. All analysis was carried out in accordance with BS1377:1990 Methods of Test for Soils for Civil Engineering Purposes.

Geotechnical laboratory analysis specific for the acoustic bund scheme, is summarised below in Table 5-1 below:

Table 5-1 Summary of geotechnical laboratory analysis

Test	Quantity	Standard
Classification Testing		
Plasticity Index	6	BS1377-2:1990, Clause 4.4 and 5
Moisture Content	6	BS1377-2:1990, Clause 3.2
Particle Size Distribution (Wet sieve)	6	BS1377-2:1990, Clause 9.2
Particle Size Distribution (Sedimentation)	6	BS1377-2:1990, Clause 9.2
Strength Testing		
Shear box Testing	5	BS1377-7:1990, Clause 4
Chemical Testing		
pH	15	BS1377-3:1990
Sulphate as SO ₄ Water Soluble (2:1)	15	BS1377-3:1990

Laboratory geotechnical analysis certificates are presented in Appendix 3 and summarised below.

5.1 Laboratory Classification

5.1.1 Soil Classification Tests

Soil classification testing was undertaken, including Atterberg limits and Moisture Content, pH, Sulphates and Particle Size Distribution via wet/dry sieves and sedimentation.

Six (6no.) soil samples were submitted to the laboratory for Atterberg Limit testing. Soil Plasticity results are summarised in Table 5-2 below.

Table 5-2 Summary of Plasticity results

Location	Depth (m)	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Percentage passing 425µm sieve (%)	Modified Plasticity Index	Remarks	
								Plasticity	Volume Change Potential
CP101	5.00	24	32	17	15	86	12.9	Low	Low
CP102	5.00-6.00	28	49	23	26	96	24.96	Intermediate	Medium
CP103	5.00-5.45	22	47	22	25	94	23.5	Intermediate	Medium
CP104	4.00-4.45	22	46	22	24	95	22.8	Intermediate	Medium
CP104	7.00	19	-	NP	-	-	-	-	-
CP105	4.00-4.45	24	46	23	23	97	22.31	Intermediate	Medium

The results presented in Table 5-2 indicates that the fine-grained soils encountered between 4.00-5.00m bgl are of low to intermediate plasticity with a low medium Volume Change Potential. CP104 at 7.00m bgl has be analysed as Non-Plastic (NP).

5.1.2 Particle Size Distribution Tests

Six (6 no.) soil samples were submitted to the laboratory for Particle Size Distribution testing via wet/dry sieve and sedimentation, the results are presented below in Table 5-3. The tests are generally consistent with the field descriptions. Geotechnical test results are presented within Appendix IX.

Table 5-3 Summary of Particle Size Distribution results

Location	Depth	Lab Description	Granulometric Composition (%)				
			Clay	Silt	Sand	Gravel	Cobbles
CP101	10.00-11.00	Brown mottled grey very silty SAND.	12	20	68	0	0
CP102	5.00-6.00	Brown mottled grey sandy CLAY.	39	43	18	0	0
CP102	15.00-16.00	Brown mottled grey silty SAND.	2	9	89	0	0
CP103	10.00	Brown mottled grey very sandy CLAY.	23	27	50	0	0
CP104	7.00	Brown mottled grey very silty SAND.	4	12	84	0	0
CP105	12.00	Brown slightly gravelly slightly silty SAND.	4		95	1	0

5.1.3 Consolidated Drained Shear Box Testing

Five (5no.) Consolidated Drained Shear Box Testing were undertaken on selected soil samples. Results are summarised in Table 5-4.

Table 5-4 Summary of Shear Box Testing results

Location	CP102	CP102	CP103	CP104	CP105
Depth (m bgl)	3.00-3.45	6.00-6.45	6.00-6.45	5.00-5.45	5.00-5.45
Initial Bulk Density (Mg/m ³)	1.89	2.08	1.98	2.01	1.92
Initial Moisture Content (%)	32	22	27	23	27

Location	CP102	CP102	CP103	CP104	CP105
Initial Dry Density (Mg/m ³)	1.44	1.71	1.55	1.64	1.52
Peak Shear Stress (kPa)	118	131	131	131	126
Angle of Shearing Resistance (ϕ)	26	30	32	31	32
Effective Cohesion (kPa)	20	17	7	11	2

Results show that the undrained shear strength of the clay at 3.00-6.45m bgl is between 118-131kPa.

5.1.4 pH and Sulphate

Sixteen (16no.) chemical analyses for pH and soluble sulphate content are presented in Appendix IX and are summarised in Table 5-5.

Table 5-5 Summary of pH and SO₄ results

Location	Depth (m bgl)	SO ₄ in 2:1 water / soil (mg/l)	pH Value
CP101	3.00-3.45	<10	7.8
CP101	14.00-15.00	128	7.1
CP101	15.00-15.20	397	5.7
CP102	4.00-4.45	370	4.9
CP102	6.45-6.60	339	6.2
CP102	15.00-15.10	209	4.8
CP103	5.00-5.45	562	4.8
CP103	6.00-6.45	171	5.1
CP103	13.50	238	6.2
CP103	18.00	134	8.0
CP104	7.50-7.70	407	3.5
CP104	12.00	175	7.4
CP104	21.00	211	4.3
CP105	5.45-5.60	254	4.9
CP105	9.00	304	4.6
CP105	10.50	297	4.8

Utilising the data in Table 5-5 the soils on site have been classified utilising Table C2 of BRE Special Digest 1 (2005) for brownfield developments due to its former historical use as a horticultural nursey.

Due to the size of the data set being greater than 10, the mean of the highest 20% sulphate results and the mean of the lowest 20% pH values as stated in BRE Special Digest (2005) have been used for the site, giving a site characteristic value for sulphate of 455mg/l and a pH value of 4.13.

Utilising Table C2 and the sulphate classes for groundwater and the water/soil extracts tests the results are indicative of a Design Sulphate Class 1 and an Aggressive Chemical Environment for Concrete of AC-4z.

6.0 Geotechnical Assessment

Due to insufficient bearing capacity soils being encountered in the initial phase of investigation (A11463/1.0) it is understood that a piled solution is being considered as the foundation type at Tree Tops Nursey. Therefore, preliminary single pile calculations, based on existing site levels, have been undertaken in order to assess the strengths of deeper ground conditions. Structural loadings and final site levels have

not been made available such that the final depth and type of foundation required following design could vary.

6.1 Ground Model

The following ground model with geotechnical parameters has been undertaken based on in-situ testing, laboratory analysis and descriptions made and undertaken during this investigation.

Table 6-1 - Preliminary ground model and characteristic geotechnical parameters

Stratum	Unit Weight (γ_k)	Shear Strength				Sources
		Undrained		Effective		
		c_{uk} (kN/m ²)	φ_{uk} (°)	c'_k (kN/m ²)	φ'_k (°)	
From Existing Ground Level to maximum of 3.00m bgl (CP105). Used 1.00m bgl for model.						
Made Ground/ Topsoil	Not used in foundation design No shaft resistance included from the stratum					
From 1.00 to ~7.00mbgl						
Wittering Formation (fine-grained)	19kN/m ³	27 at 1.00mbgl to 144 at 6.00mbgl	0	11	30°	γ_k Fig 1 & 2 BS8004 c_{uk} SPT & HSV, Graph 2 Correlation with I_{pk} (fine grained), φ'_k Laboratory testing average c'_k Laboratory testing average
From ~7.00 to >22.50m bgl						
Wittering Formation (coarse-grained)	20kN/m ³	Granular material		0	42°	γ_k Fig 1 & 2 BS8004 c_{uk} SPT & HSV, Graph 2 Correlation with N value and based on BS8004 and BS1997-2, φ'_k relationship to N value (Meyorhof)
Groundwater at ~7.00mbgl						
Notes ⁽¹⁾ <i>stratum depths and thicknesses are measured from existing ground level</i>						

7.0 Piled Foundation

Depending on foundation column load requirements, a choice of pile lengths and diameters can be designed to bear into the Wittering Formation. The proven ground conditions would indicate that continuous flight auger (CFA) piles could be employed to provide a suitable foundation solution although this is for discussion purposes only. Where groundwater and/or unstable ground conditions are encountered, casing should be considered for CFA piles.

7.1 Design Approach

Given the properties of the strata beneath the site, values for axially loaded piles have been determined using the relationships presented in BS EN 1997-2, Combination 1.

Although higher carrying capacities are often achieved by driven piles, the use of driven piles can cause

environmental issues (noise and vibration). Therefore, the initial axial resistance calculations have been carried out on augered piles.

The ULS axial resistances of 0.30, 0.45 and 0.60m diameter augered pile of varying length have been determined for the ground model presented in Table 7-1.

Table 7-1 Pile Resistances bearing into the Wittering Formation – Augered Pile

Pile Diameter (m)	Pile Length (m)	Design Pile Resistance (kN)			
		MG	Skin Friction (Rsd)	End Bearing (Rbd)	Design Axial Pile Resistance (kN)
0.30	10.0	No input in Axial Resistance	527	398	926
	12.5		366	468	834
	15.0		496	538	1034
0.45	10.0	No input to Axial Resistance	1120	896	2015
	12.5		549	1054	1603
	15.0		744	1212	1955
0.60	10.0	No input to Axial Resistance	1931	1593	3523
	12.5		732	1873	2606
	15.0		992	2154	3146

The above pile axial resistances are subject to design. A detailed piled foundation design will be required once the pile layout is finalised by a piling contractor and structural engineer.

It is recommended that early discussions with an experienced piling contractor is undertaken to clarify the pile diameters. Once the pile cap, positions and diameters are known further pile group analysis may be required.

Subject to NHBC, regulatory and/or design requirements, the potential may exist to calculate bearing capacities and settlement for foundations in accordance with EC7 through production of a Geotechnical Design Report (GDR).

If you have any queries or wish to discuss the findings above in more detail, please do not hesitate to get in touch,

Yours sincerely,



Grace Larcombe
Senior Geo-Environmental Consultant

Attachments:

- Attachment 1 – Figures
- Attachment 2 – Borehole Logs

- Attachment 3 – Laboratory Testing Certificates
- Attachment 4 - Photographs

Attachment 1 – Figures

Key



Site boundaries



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Job Title:

Client:

Treetops Nursery, Fair Oak

Vistry Southern

Project No:

A11463

Date:

11/11/2020

Drawn By:

GL

Authorised By:	
----------------	--

AK

Scale:

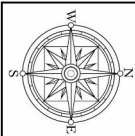
1 square
= 1km²

Notes:

Licence:
0100058169

Drawing Title:

Figure 1.0 - Site location plan



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Job Title:

Treetops Nursery, Fair Oak

Client:

Vistry Southern

Project No:

A11609

Date:

15/07/2021

Drawing Title:

Figure 2.0 - Proposed
Development Plan

Drawn By:

H.Spurling

Authorised By:

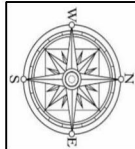
G.Larcombe

Scale:

Not to
scale

Notes:

Key



Approximate Cable Percussive
Borehole Location
CP101

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Job Title:

Treetops Nursey, Fair Oak

Client:

Vistry Southern

Project No:

A11609

Date:

30/06/2021

Drawing Title:

Figure 3.0 - Intrusive Location
Plan

Drawn By:

C. Tyrrell

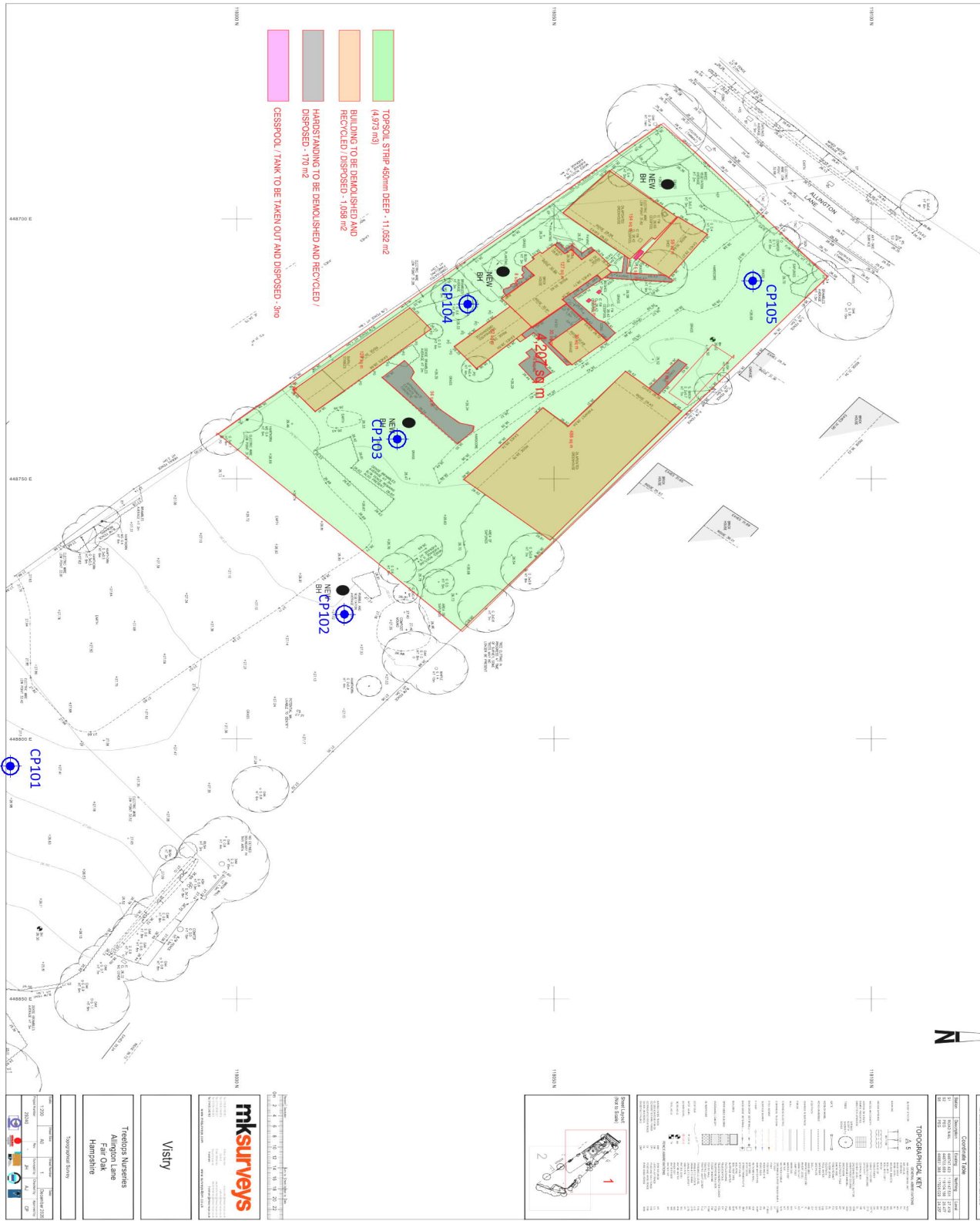
Authorised By:

G. Larcombe

Scale:

NTS

Notes:



Attachment 2 – Borehole Logs



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Borehole Log

Borehole No.

CP101

Sheet 1 of 2

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448827.00 - 117923.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 28/06/2021 - 29/06/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40			Grass over light brown slight sandy gravelly SILT. Sand is fine. Gravel is fine to medium, sub angular to sub rounded flint and chalk. (TOP SOIL)	
		1.20 1.20 - 1.65	D	N=5 (1,1/1,1,1,2)	1.00			Soft to firm light brown and orange slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine sub angular to sub rounded flint and chalk. (WITTERING FORMATION)	1
		2.00 2.00 - 2.45	D	N=10 (1,2/2,2,3,3)	2.00			Soft orangey brown slightly sandy CLAY. Sand is fine to coarse. (WITTERING FORMATION)	2
		3.00 3.00 - 3.45	D	N=7 (1,1/1,2,2,2)	3.00			Soft to firm mottled orange and grey slightly sandy CLAY. Sand is fine. (WITTERING FORMATION)	3
		4.00 4.00 - 4.45	D	N=6 (1,1/1,1,2,2)	4.50			Soft to firm orange brown slightly sandy CLAY. Sand is fine to coarse. (WITTERING FORMATION)	4
		5.00 5.00 - 5.45	B D	N=18 (2,2/6,5,4,3)	5.00			Soft to firm light orange yellowish brown slight sandy CLAY. Sand is fine to coarse. With occasional fine sub angular to sub rounded gravel of flint. (WITTERING FORMATION)	5
		5.00 5.00 - 5.45	D		5.40			Soft yellowish light brown very sandy CLAY. Sand is fine to coarse. (WITTERING FORMATION)	
		6.00 6.00 - 6.45	D	N=15 (2,2/3,4,4,4)	5.90			Soft to firm dark grey purpley black sandy CLAY. Sand is fine to coarse. (WITTERING FORMATION)	6
					7.30			Soft to firm dark grey purpley black very sandy CLAY. Sand is fine to coarse. (WITTERING FORMATION)	7
		7.50		N=50 (6,6/50 for 160mm)				Dark grey clayey fine to coarse SAND. (WITTERING FORMATION)	8
		9.00 9.00 - 9.20	D	N=50 (25 for 125mm/50 for 75mm)					9
								Continued on next sheet	10

Remarks

Cleated by Cable Avoidance Tool. Groundwater strike at 5.10m rising to 2.50m. Hole terminated at 15.20m due to obstruction, slow drilling and blowing sands.





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Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.

CP101

Sheet 2 of 2

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448827.00 - 117923.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

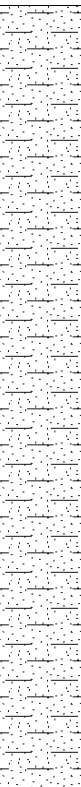
Level:

Scale
1:50

Client: Vistry Southern

Dates: 28/06/2021 - 29/06/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.00		N=50 (25 for 95mm/50 for 85mm)					
		10.00 - 10.20	D						
		10.00 - 11.00	B						11
		12.00		N=50 (8,12/50 for 75mm)					12
		13.50		N=27 (28,23/27 for 45mm)					13
		13.50 - 13.80	D						
		14.00 - 15.00	B						14
		15.00 - 15.20	D						15
		15.20		N=50 (25 for 140mm/50 for 65mm)	15.20			End of borehole at 15.20 m	16
									17
									18
									19
									20

Remarks

Cleated by Cable Avoidance Tool. Groundwater strike at 5.10m rising to 2.50m. Hole terminated at 15.20m due to obstruction, slow drilling and blowing sands.





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Borehole Log

Borehole No.

CP102

Sheet 1 of 2

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448778.00 - 118012.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 30/06/2021 - 01/06/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.50			Grass over dark brown slightly gravelly clayey fine SAND. Gravel is fine sub angular flint. (TOP SOIL)	
		1.20 1.20 - 1.65	D	N=4 (1,1/1,1,1,1)	1.65			Soft to firm orange mottled grey sandy CLAY. Sand is fine. (WITTERING FORMATION)	1
		2.00 2.00 - 2.45	D	N=6 (1,1/1,1,2,2)				Soft to firm orange light brown sandy CLAY. Sand is fine. (WITTERING FORMATION)	2
		3.00 - 3.45 3.00 - 3.45	U U	Ublow=150	3.45			Firm orange mottled grey some oxidation slightly sandy CLAY. Sand is fine to coarse. (WITTERING FORMATION)	3
		4.00 4.00 - 4.45	D	N=16 (2,3/3,4,4,5)	4.00			Firm dark grey slightly sandy CLAY. Sand is very fine. (WITTERING FORMATION)	4
		5.00 5.00 - 5.45 5.00 - 6.00	D B	N=26 (4,5/6,6,7,7)	4.50			Firm to stiff dark grey and purpley grey slightly sandy CLAY. Sand is very fine to fine. (WITTERING FORMATION)	5
		6.00 - 6.45 6.00 - 6.45 6.45 - 6.60	U U D	Ublow=200					6
		7.50 7.50 - 7.95	D	N=32 (5,6/8,8,9,7)	7.20			Dark grey clayey fine to coarse SAND. (WITTERING FORMATION)	7
		9.00 9.00 - 9.45	D	N=50 (25 for 85mm/50 for 70mm)					9
		10.00 - 11.00	B						10

Continued on next sheet

Remarks

Cleared by Cable Avoidance Tool. Groundwater strike at 1.00, rising to 0.80m. Groundwater strike at 7.20m rising to 6.70m. Hole terminated at 19.50m due to obstruction, slow drilling and blowing sands.





Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.

CP102

Sheet 2 of 2

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448778.00 - 118012.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 30/06/2021 - 01/06/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50		N=50 (25 for 80mm/50 for 50mm)	10.50				
		10.50 - 10.70	D					Dark grey fine to coarse SAND. (WITTERING FORMATION)	11
		12.00		N=50 (25 for 50mm/50 for 60mm)					12
		12.00 - 12.10	D						13
		13.50		N=50 (25 for 75mm/50 for 50mm)					14
		13.50 - 13.60	D						15
		15.00		N=50 (25 for 60mm/50 for 60mm)					16
		15.00 - 15.10 15.00 - 16.00	D B						17
		16.50		N=50 (25 for 50mm/50 for 60mm)					18
		16.50 - 16.60	D						19
		18.00		N=50 (25 for 40mm/50 for 60mm)					20
		18.00 - 18.10	D						
		19.00 - 19.50	B						
		19.50		N=50 (25 for 35mm/50 for 40mm)	19.50			End of borehole at 19.50 m	
		19.50 - 19.60	D						

Remarks

Cleared by Cable Avoidance Tool. Groundwater strike at 1.00, rising to 0.80m. Groundwater strike at 7.20m rising to 6.70m. Hole terminated at 19.50m due to obstruction, slow drilling and blowing sands.





Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.

CP103

Sheet 1 of 2

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448748.00 - 118030.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 02/07/2021 - 05/07/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			Grass over concrete slab. (MADE GROUND)	
					0.40			Soft brown sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine sub angular flint and brick.	
					0.60			(MADE GROUND) Soft light brown orange sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium angular flint.	1
		1.20 1.20 - 1.65	D	N=6 (1,1/1,2,1,2)				(WITTERING FORMATION) Soft orange mottled grey slightly sandy CLAY. with occasional fine sub angular gravel of flint. Sand is fine to coarse.	
		2.00 2.00 - 2.45	D	N=12 (1,2/2,3,3,4)				(WITTERING FORMATION) At 2.00m bgl Soft to firm CLAY. No sand or gravel. At 3.0m bgl mottled orange grey and oxidised red coloured.	2
		3.00 3.00 - 3.45	D	N=17 (2,3/4,4,4,5)				Soft to firm dark grey sandy CLAY. Sand is fine to medium.	3
		4.00 4.00 - 4.45	D	N=22 (3,4/5,5,6,6)	3.50			(WITTERING FORMATION)	4
		5.00 5.00 - 5.45 5.00 - 6.00	D B	N=31 (4,5/6,8,8,9)				Firm dark grey very sandy CLAY. Sand is fine.	5
		6.00 - 6.45	U	Ublow=200				(WITTERING FORMATION)	6
		6.45 - 6.60	D		6.45			Firm dark grey very sandy CLAY. Sand is fine.	7
		7.50 7.50 - 7.95	D	N=50 (8,10/50 for 290mm)	7.20			Dark grey fine to coarse SAND. (WITTERING FORMATION)	8
		9.00 9.00 - 9.80	D	N=50 (25 for 115mm/50 for 125mm)				At 9.0m bgl rare medium sub angular gravel of flint.	9
		10.00	B		10.00				10

Continued on next sheet

Remarks

Cleared by Cable Avoidance Tool. Groundwater strike at 7.20m rising to 6.20m. Hole terminated at 18.00m due to obstruction, slow drilling and blowing sands.





Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.

CP103

Sheet 2 of 2

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448748.00 - 118030.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 02/07/2021 - 05/07/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 10.50	D	N=80 (25 for 70mm/80 for 75mm)	12.00			Light brown yellowish fine to coarse SAND. (WITTERING FORMATION)	11
		12.00 12.00	D	N=50 (25 for 50mm/50 for 70mm)				Light to dark grey with some light brown fine to coarse SAND. (WITTERING FORMATION)	12
		13.50 13.50	D	N=50 (2,13/50 for 65mm)	13.50			Dark grey fine to coarse SAND. (WITTERING FORMATION)	13
		15.00 15.00	D	N=50 (5,9/50 for 75mm)					14
		16.50 16.50	D	N=50 (5,7/50 for 110mm)	18.00				15
		18.00 18.00	D	N=50 (79 for 75mm/50 for 70mm)					16
									17
									18
									19
									20

Remarks

Cleared by Cable Avoidance Tool. Groundwater strike at 7.20m rising to 6.20m. Hole terminated at 18.00m due to obstruction, slow drilling and blowing sands.





Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.

CP104

Sheet 1 of 3

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448733.00 - 118045.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 06/07/2021 - 08/07/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 0.20 0.30 0.50						Concrete Slab. (MADE GROUND)	
		1.20 1.20 - 1.65	D	N=4 (1,1/1,1,1,1)				Soft brown and grey slightly sandy lightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sub angular flint with some concrete fragments from the slab. (MADE GROUND)	1
		2.00 2.00 - 2.45	D	N=13 (2,2/3,4,3,3)				Yellowish light brown very gravelly coarse SAND. Gravel is fine to medium sub angular flint. (MADE GROUND)	
								Soft dark grey slightly sandy CLAY. Sand is fine. (MADE GROUND)	
								Soft light grey greeny mottled orange slightly sandy CLAY. Sand is fine to coarse. (WITTERING FORMATION) <i>At 2.0m bgl Clay is soft to firm.</i>	2
		3.00 3.00 - 3.45	D	N=21 (4,4/5,5,5,6)	3.00			Firm orange oxidised red with some grey CLAY. (WITTERING FORMATION)	3
		4.00 4.00 - 4.45	D	N=20 (2,3/4,5,5,6)	3.80			Firm dark grey slightly sandy CLAY. Sand is fine to coarse. (WITTERING FORMATION)	4
		5.00 - 5.45	U	Ublow=150				Dark grey slightly clayey fine to coarse SAND. Rare rounded medium gravel of flint. (WITTERING FORMATION)	5
		5.45 - 5.60	D		5.80				
		6.00 6.00 - 6.45	D	N=25 (4,4/5,6,6,8)					6
		7.00	B						7
		7.50 7.50 - 7.70	D	N=50 (25 for 100mm/50 for 60mm)				<i>At 7.50m bgl No gravel</i>	8
		9.00 9.00 - 9.30	D	N=50 (25 for 106mm/50 for 95mm)	9.00			Dark grey fine to coarse SAND. (WITTERING FORMATION)	9
									10

Continued on next sheet

Remarks

Cleared by Cable Avoidance Tool. Groundwater strike at 5.80m rising to 5.10m.





Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.

CP104

Sheet 2 of 3

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448733.00 - 118045.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 06/07/2021 - 08/07/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 10.50 - 10.60	D	N=50 (25 for 70mm/50 for 70mm)					11
		12.00 12.00 12.00 - 12.20	B D	N=50 (25 for 136mm/50 for 50mm)					12
		13.50 13.50 - 13.60	D	N=50 (25 for 70mm/50 for 38mm)					13
		15.00 15.00 - 15.10	D	N=50 (25 for 70mm/50 for 40mm)					14
		16.50 16.70	D	N=50 (3,17/50 for 70mm)					15
		18.00 18.00 18.00	B D	N=0 (75 for 80mm/0 for 0mm)					16
		19.50 19.50 - 19.80	D	N=50 (7,13/50 for 105mm)					17
									18
									19
									20

Continued on next sheet

Remarks

Cleared by Cable Avoidance Tool. Groundwater strike at 5.80m rising to 5.10m.





Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.

CP104

Sheet 3 of 3

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448733.00 - 118045.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 06/07/2021 - 08/07/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		21.00 21.00	D	N=50 (25 for 70mm/50 for 60mm)	22.50				21
		22.50 22.50	D	N=50 (25 for 50mm/50 for 50mm)					22
								End of borehole at 22.50 m	23
									24
									25
									26
									27
									28
									29
									30

Remarks

Cleared by Cable Avoidance Tool. Groundwater strike at 5.80m rising to 5.10m.





Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.

CP105

Sheet 1 of 2

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448720.00 - 118084.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 08/07/2021 - 09/07/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 0.20 0.30 0.50						Made ground fine to cobble size angular to sub angular GRAVEL of brick, tile, plastic, broken tarmac, concrete. (MADE GROUND)	
		1.00 1.20 - 1.65	D	N=9 (2,2/2,2,2,3)				Dark brown slightly silty sandy angular to sub angular fine to cobble sized GRAVEL of brick, concrete, glass, tarmac. Sand is fine to coarse. (MADE GROUND)	1
		2.00 2.00 - 2.45	D	N=18 (2,2/3,4,5,6)	2.00			Yellowish light brown gravelly fine SAND. Gravel fine sub angular flint. (MADE GROUND)	
		3.00 3.00 - 3.45	D	N=24 (3,4/5,6,6,7)	3.00			Dark brown slightly silty sandy fine to cobbles size angular to sub angular brick and concrete GRAVEL. (MADE GROUND)	2
		4.00 4.00 - 4.45	D	N=27 (4,5/6,6,7,8)				Soft to firm yellowish light brown sandy CLAY. Sand is fine to coarse. (MADE GROUND)	
		5.00 - 5.45	U	Ublow=150				Soft to firm orange mottled grey some oxidised red slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine angular brick. (MADE GROUND)	3
		5.45 - 5.60 5.50	D B					Soft to firm orange mottled grey and red slightly sandy CLAY. Sand is fine to coarse. (WITTERING FORMATION)	
		6.00 6.00 - 6.45	D	N=32 (5,6/7,8,8,9)					6
		7.50 7.50	D	N=50 (8,12/50 for 155mm)	7.10			Dark grey clayey coarse SAND. (WITTERING FORMATION)	7
		9.00 9.00	D	N=50 (25 for 135mm/50 for 70mm)					9

Continued on next sheet

Remarks

Cleared by Cable Avoidance Tool. Groundwater at 7.10m rising to 6.00m. Hole terminated at 18.00m due to obstruction, slow drilling and blowing sands.





Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

Borehole Log

Borehole No.

CP105

Sheet 2 of 2

Project Name: Treetops Nursery CP works

Project No.
A11609

Co-ords: 448720.00 - 118084.00

Hole Type
CP

Location: Allington Lane, Fair Oak, SO50 7QD

Level:

Scale
1:50

Client: Vistry Southern

Dates: 08/07/2021 - 09/07/2021

Logged By
HS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 10.50	D	N=50 (8,14/50 for 75mm)	10.50			Dark grey fine to coarse SAND. (WITTERING FORMATION)	11
		12.00 12.00 12.00	B D	N=50 (25 for 125mm/50 for 50mm)	12.00				12
		13.50 13.50	D	N=50 (25 for 50mm/50 for 30mm)	13.50			Dark grey fine to coarse SAND. (WITTERING FORMATION)	14
		15.00 15.00	D	N=50 (25 for 50mm/50 for 50mm)					15
		16.50 16.50	D	N=50 (25 for 50mm/50 for 50mm)					16
									17
		18.00	D		18.00			End of borehole at 18.00 m	18
									19
									20

Remarks

Cleared by Cable Avoidance Tool. Groundwater at 7.10m rising to 6.00m. Hole terminated at 18.00m due to obstruction, slow drilling and blowing sands.



Attachment 3 – Laboratory Testing Certificates



LABORATORY REPORT



4043

Contract Number: PSL21/5757

Report Date: 16 August 2021
Client's Reference: A11609
Client Name: Omnia Consulting
Port Solent
Portsmouth
Hampshire
PO6 4TP

For the attention of: Hannah Spurling

Contract Title: Treetops Nursery
Date Received: 16/7/2021
Date Commenced: 16/7/2021
Date Completed: 16/8/2021

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
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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
CP101		B	5.00		Brown slightly gravelly very sandy CLAY.
CP101		B	10.00	11.00	Brown mottled grey very silty SAND.
CP102		U100	3.00	3.45	Brown sandy CLAY.
CP102		U100	6.00	6.45	Brown sandy CLAY.
CP102		B	5.00	6.00	Brown mottled grey sandy CLAY.
CP102		B	15.00	16.00	Brown mottled grey silty SAND.
CP103		D	5.00	5.45	Brown sandy CLAY.
CP103		U100	6.00	6.45	Brown very sandy CLAY.
CP103		B	10.00		Brown mottled grey very sandy CLAY.
CP104		D	4.00	4.45	Brown sandy CLAY.
CP104		U100	5.00	5.45	Brown very sandy CLAY.
CP104		B	7.00		Brown mottled grey very silty SAND.
CP105		D	4.00	4.45	Brown sandy CLAY.
CP105		U100	5.00	5.45	Brown very sandy CLAY.
CP105		D	12.00		Brown slightly gravelly slightly silty SAND.



4043

PSL

Professional Soils Laboratory

Treetops Nursery

Contract No:

PSL21/5757

Client Ref:

A11609

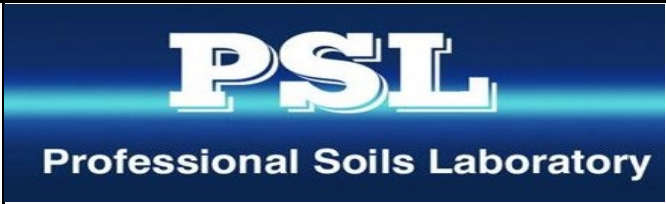
SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

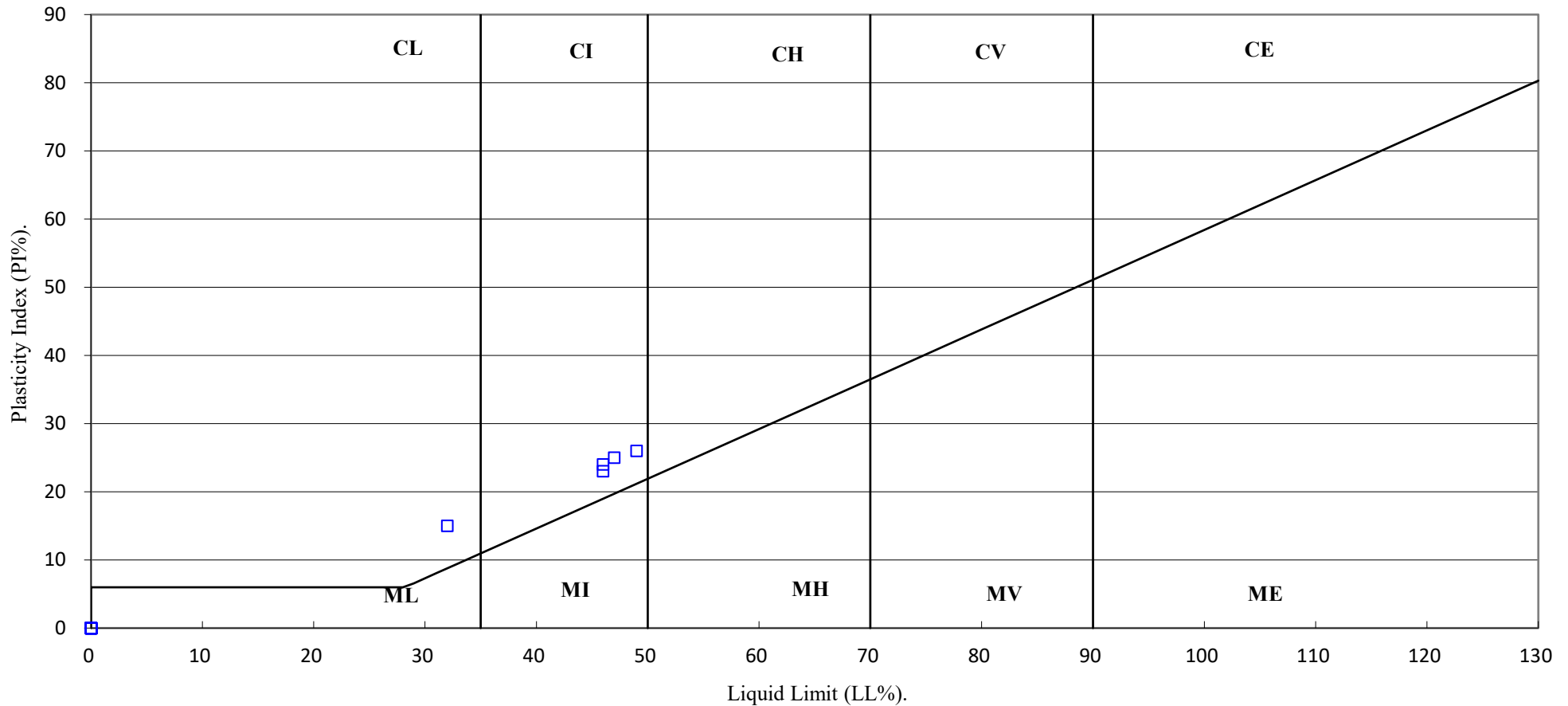
Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m ³ Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
CP101		B	5.00		24			32	17	15	86	Low Plasticity CL
CP102		B	5.00	6.00	28			49	23	26	96	Intermediate Plasticity CI
CP103		D	5.00	5.45	22			47	22	25	94	Intermediate Plasticity CI
CP104		D	4.00	4.45	22			46	22	24	95	Intermediate Plasticity CI
CP104		B	7.00		19				NP			
CP105		D	4.00	4.45	24			46	23	23	97	Intermediate Plasticity CI

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

		Treetops Nursery	Contract No:
			PSL21/5757
			Client Ref:
			A11609

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Treetops Nursery

Contract No:

PSL21/5757

Client Ref:

A11609

PARTICLE SIZE DISTRIBUTION TEST

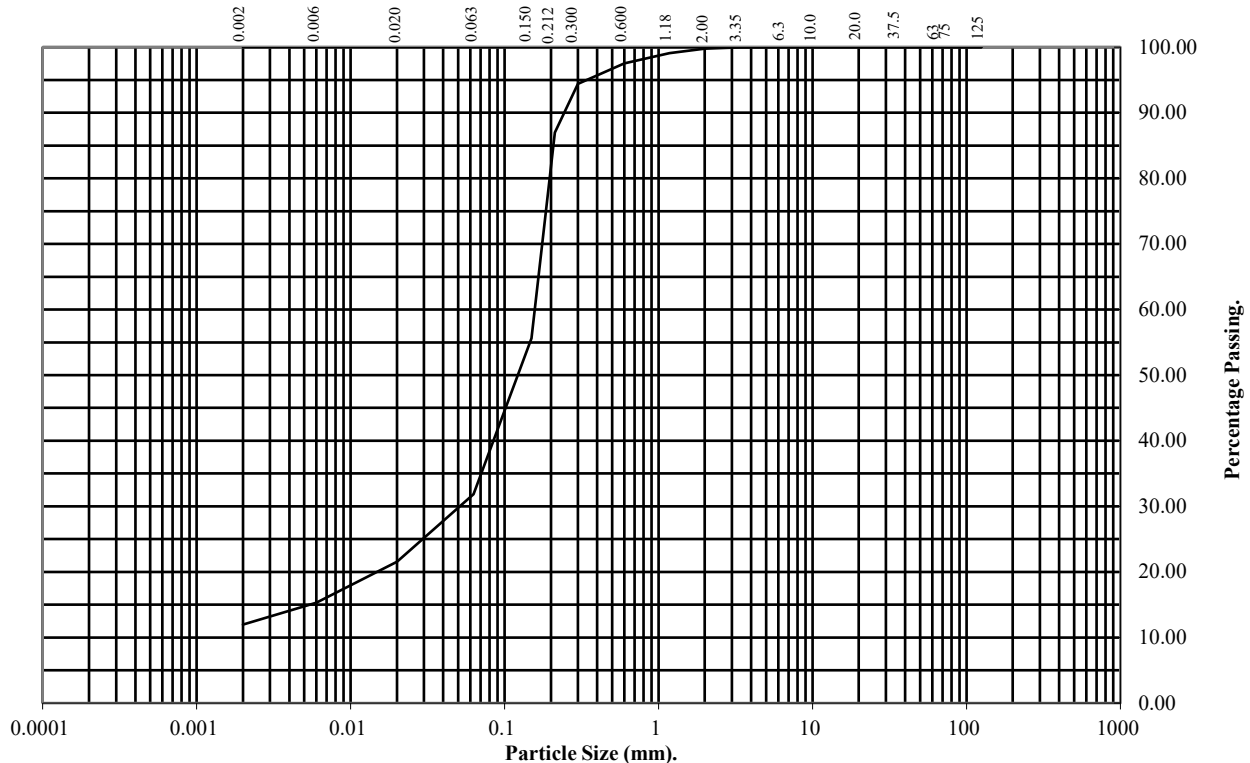
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: CP101 Top Depth (m): 10.00

Sample Number: Base Depth(m): 11.00

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	100
2	100
1.18	99
0.6	98
0.3	94
0.212	87
0.15	56
0.063	32

Particle Diameter	Percentage Passing
0.02	22
0.006	15
0.002	12

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	68
Silt	20
Clay	12

Remarks:
See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

PARTICLE SIZE DISTRIBUTION TEST

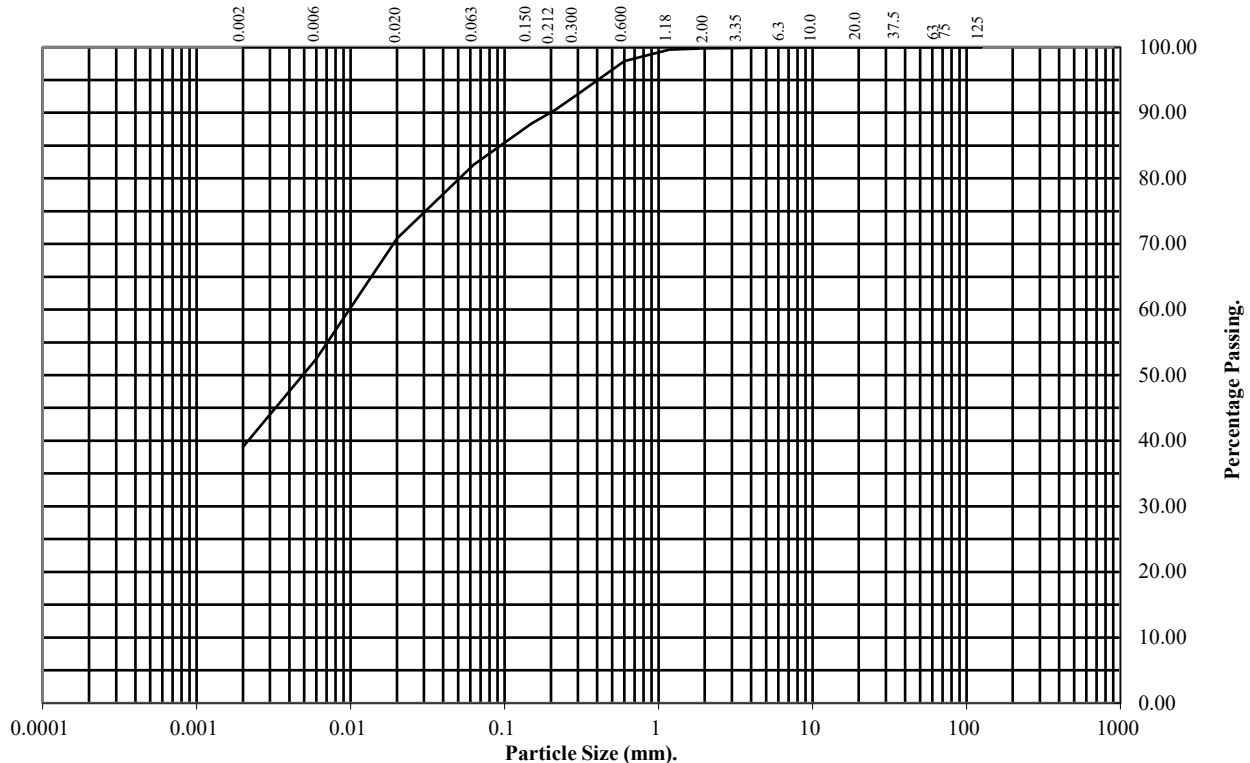
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: CP102 Top Depth (m): 5.00

Sample Number: Base Depth(m): 6.00

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	100
2	100
1.18	100
0.6	98
0.3	93
0.212	90
0.15	88
0.063	82

Particle Diameter	Percentage Passing
0.02	71
0.006	53
0.002	39

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	18
Silt	43
Clay	39

Remarks:
See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

PARTICLE SIZE DISTRIBUTION TEST

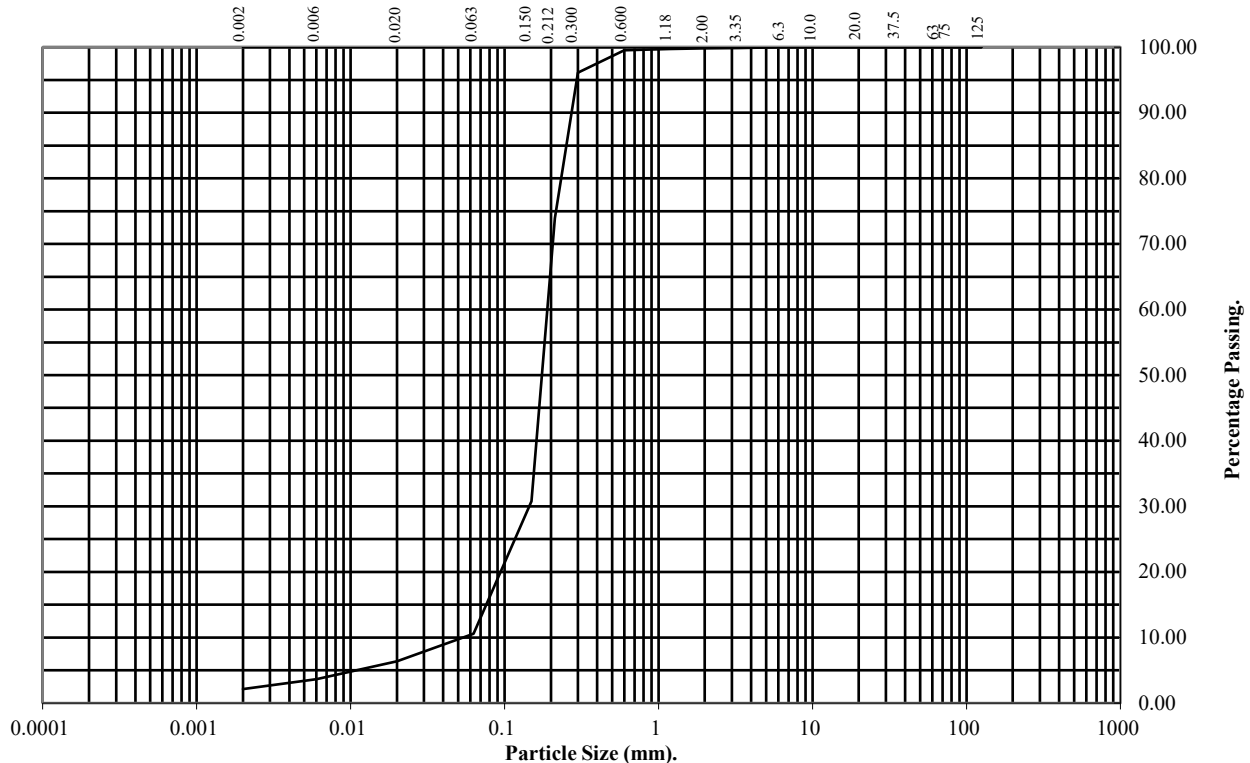
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: CP102 Top Depth (m): 15.00

Sample Number: Base Depth(m): 16.00

Sample Type: B

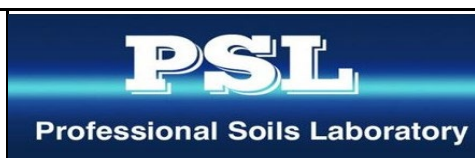


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	96
0.212	74
0.15	31
0.063	11

Particle Diameter	Percentage Passing
0.02	6
0.006	4
0.002	2

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	89
Silt	9
Clay	2

Remarks:
See Summary of Soil Descriptions



Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

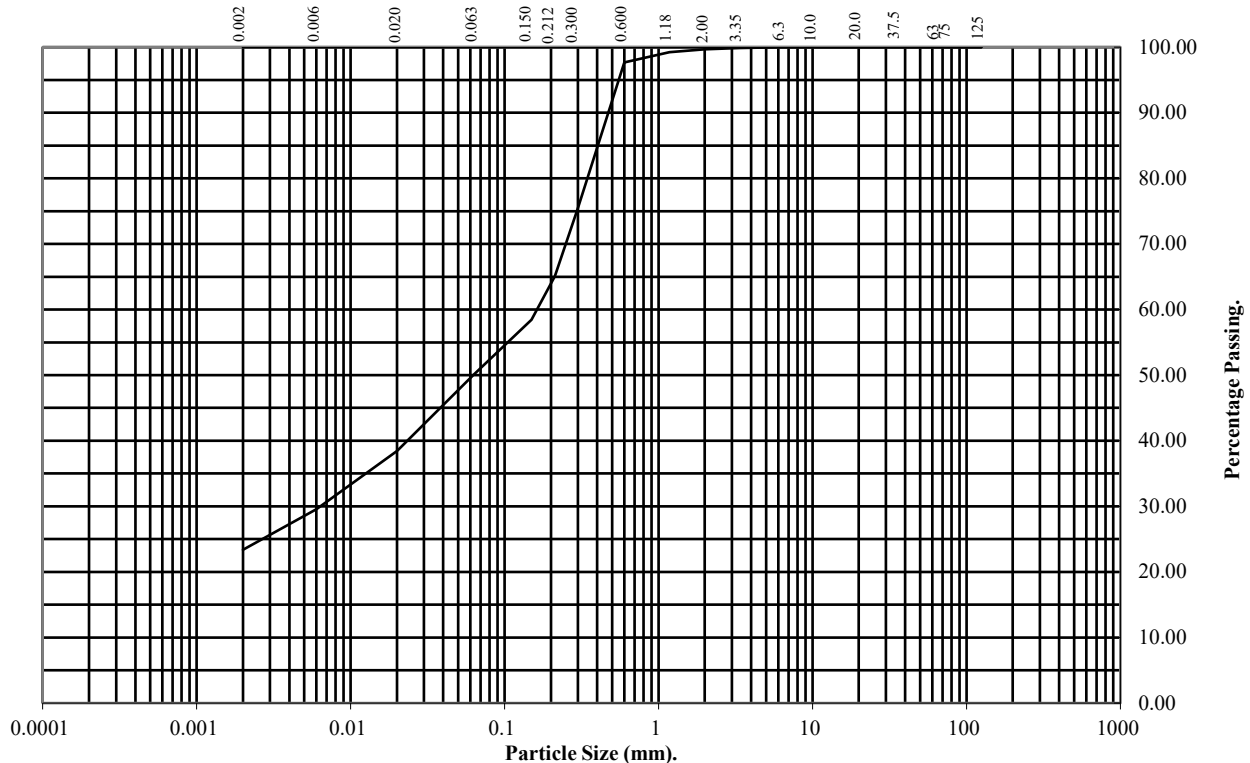
Hole Number: CP103

Top Depth (m): 10.00

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	100
2	100
1.18	99
0.6	98
0.3	75
0.212	65
0.15	58
0.063	50

Particle Diameter	Percentage Passing
0.02	38
0.006	30
0.002	23

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	50
Silt	27
Clay	23

Remarks:

See Summary of Soil Descriptions



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Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
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PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

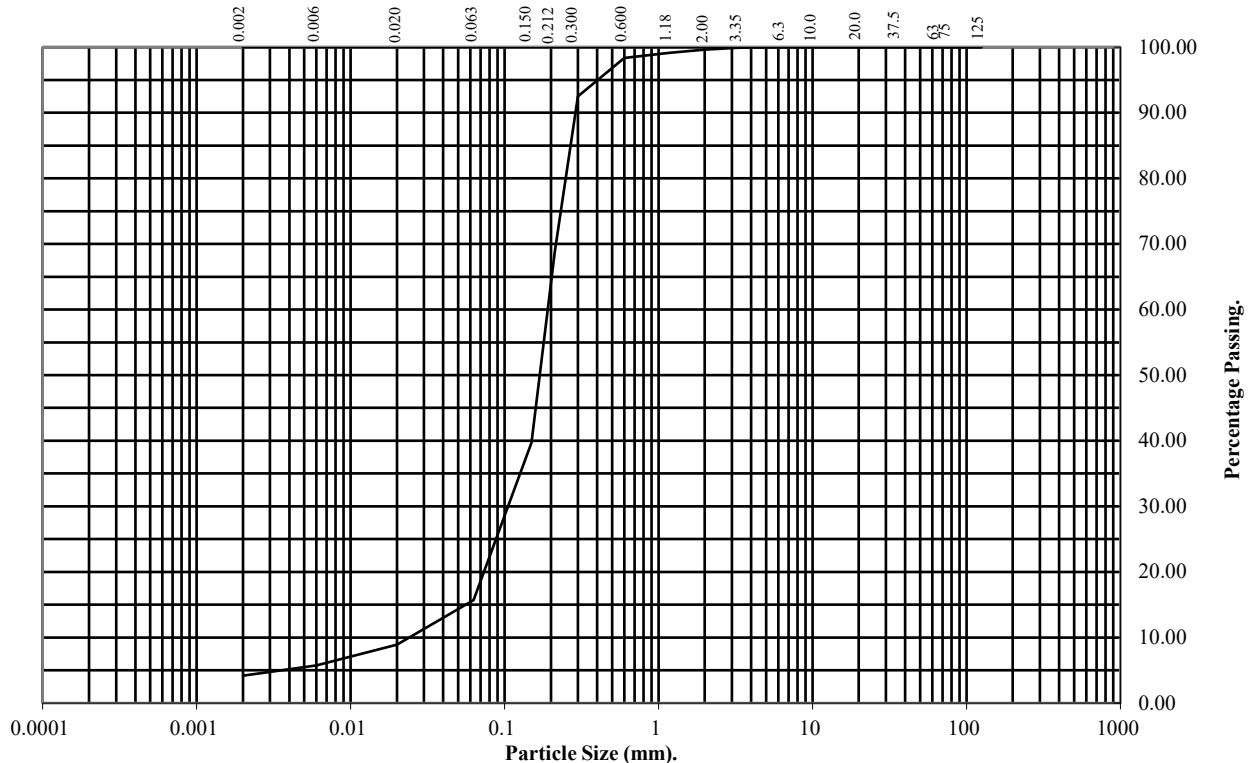
Hole Number: CP104

Top Depth (m): 7.00

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	100
2	100
1.18	99
0.6	98
0.3	92
0.212	69
0.15	40
0.063	16

Particle Diameter	Percentage Passing
0.02	9
0.006	6
0.002	4

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	84
Silt	12
Clay	4

Remarks:

See Summary of Soil Descriptions



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Contract No:
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Client Ref:
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PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

CP105

Top Depth (m):

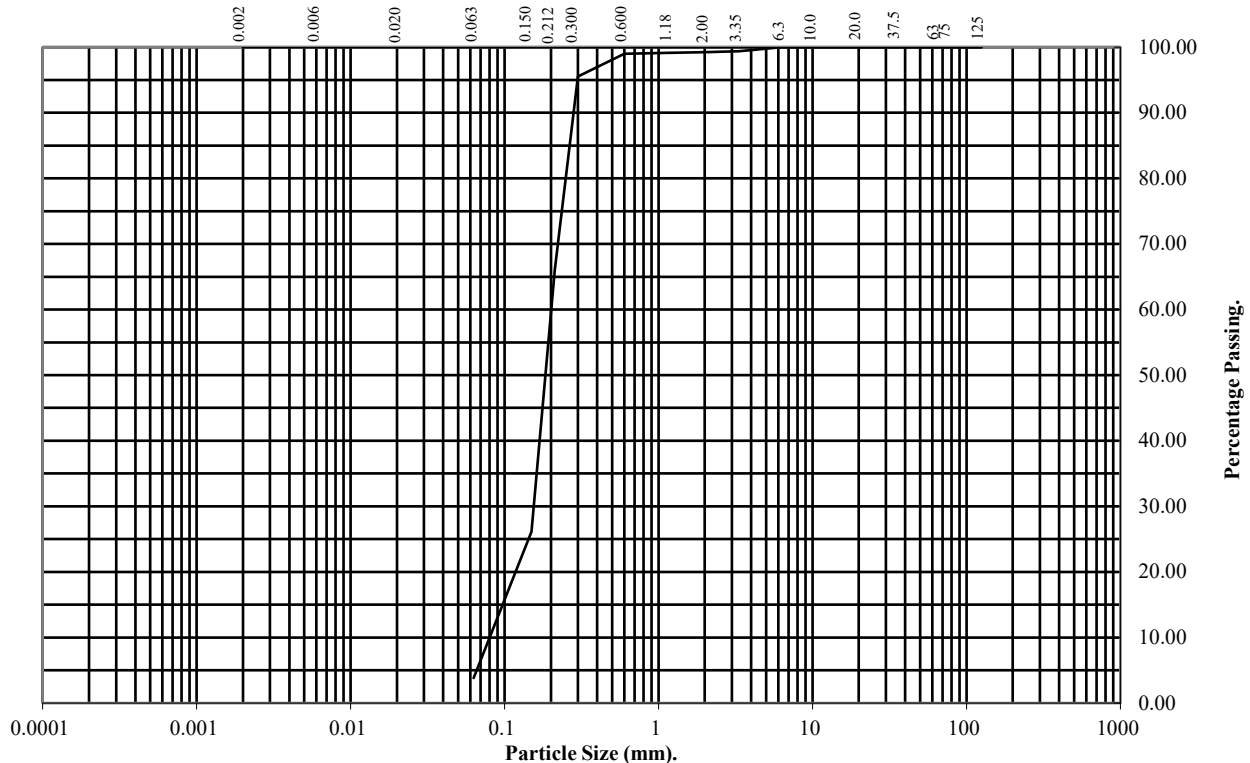
12.00

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	96
0.212	66
0.15	26
0.063	4

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	95
Silt/Clay	4

Remarks:

See Summary of Soil Descriptions



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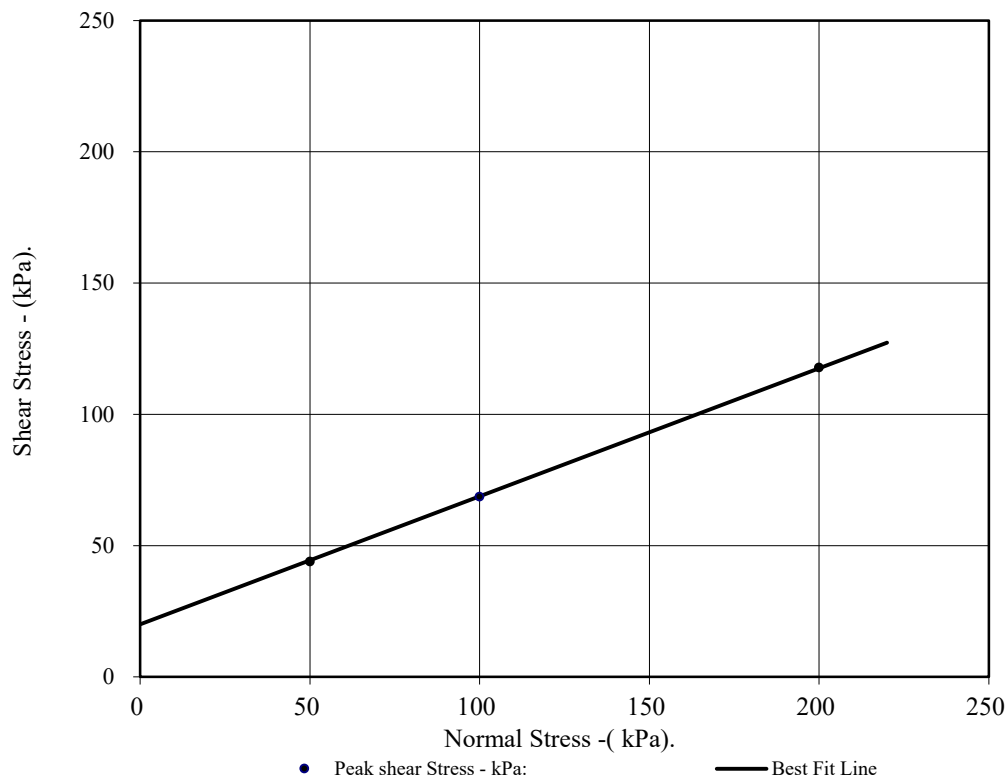
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP102		Top Depth:	3.00	
Sample Number:			Base Depth:	3.45	
Sample Conditions:	Submerged		Sample Type	U100	
Particle Density - Mg/m3:	2.65	Assumed	Remarks:		
Sample Preparation:	Cut and Trimmed Undisturbed.				
Sample Description:	See summary of soil descriptions.				
STAGE			1	2	3
Initial Conditions					
Height - mm:			20.05	20.05	20.05
Length - mm:			59.97	59.97	59.97
Moisture Content - %:			32	32	32
Bulk Density - Mg/m3:			1.89	1.90	1.89
Dry Density - Mg/m3:			1.43	1.44	1.44
Voids Ratio:			0.852	0.844	0.846
Normal Pressure- kPa			50	100	200
Consolidation Stage					
Consolidated Height - mm:			19.19	18.89	17.89
Shearing Stage					
Rate of Strain - mm/min			0.043	0.043	0.043
Displacement at peak shear stress - mm			2.40	3.01	3.01
Peak shear Stress - kPa:			44	69	118
Final Consolidated Conditions					
Moisture Content - %:			30	28	26
Bulk Density - Mg/m3:			1.97	2.01	2.12
Dry Density - Mg/m3:			1.51	1.57	1.68
Peak					
Angle of Shearing Resistance:(θ)			26		
Effective Cohesion - kPa:			20		



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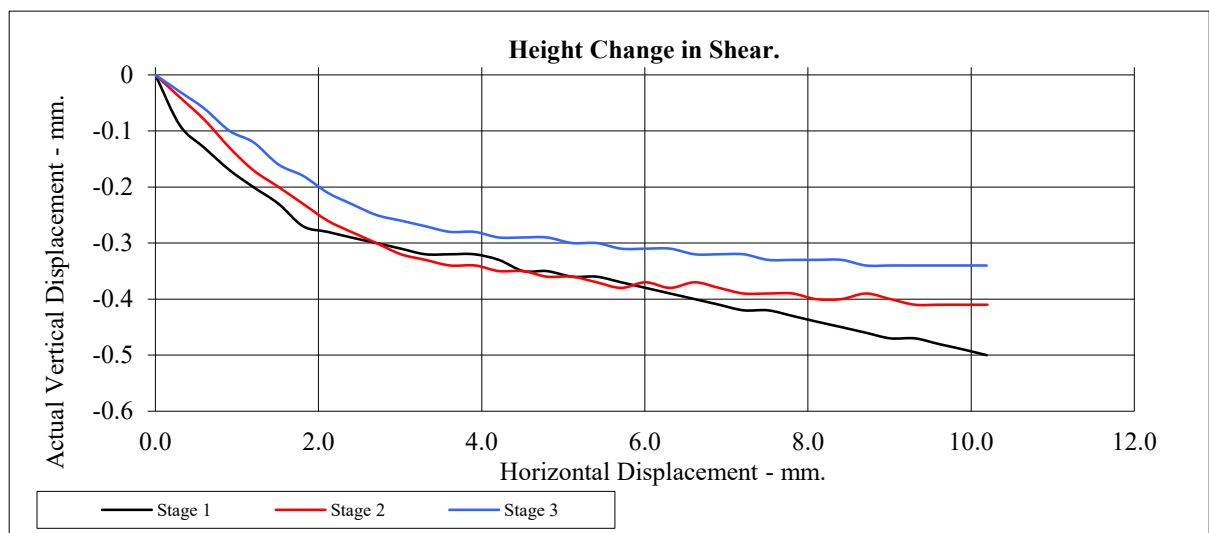
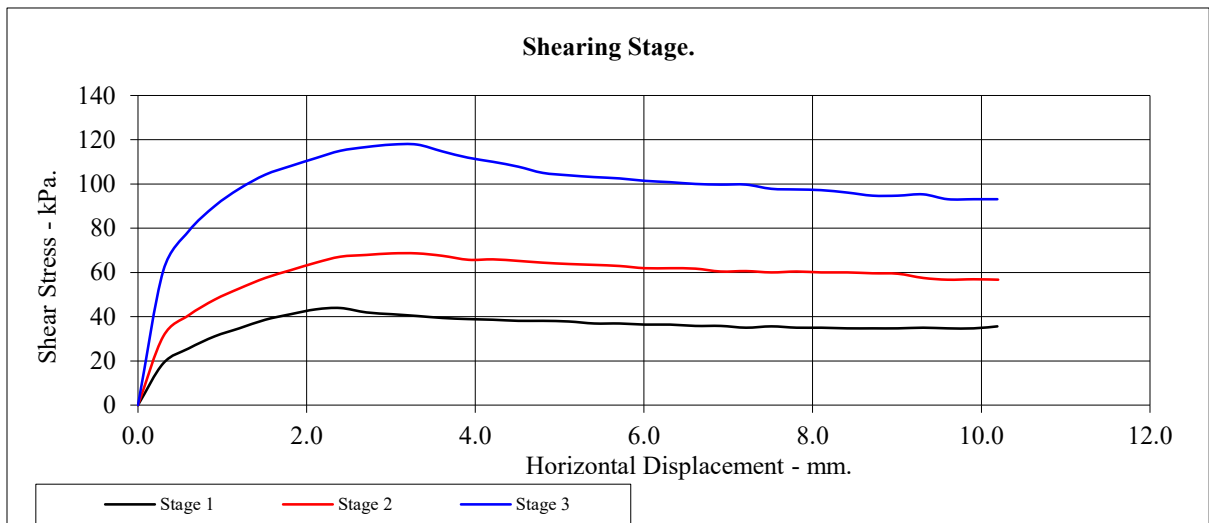
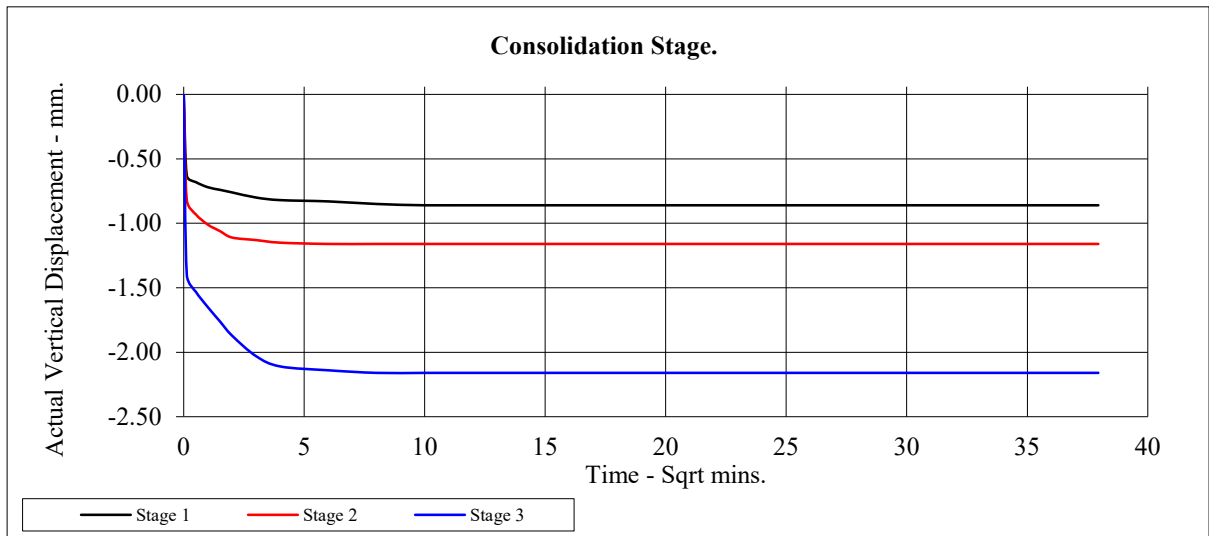
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP102	Top Depth:	3.00
Sample Number:		Base Depth:	3.45



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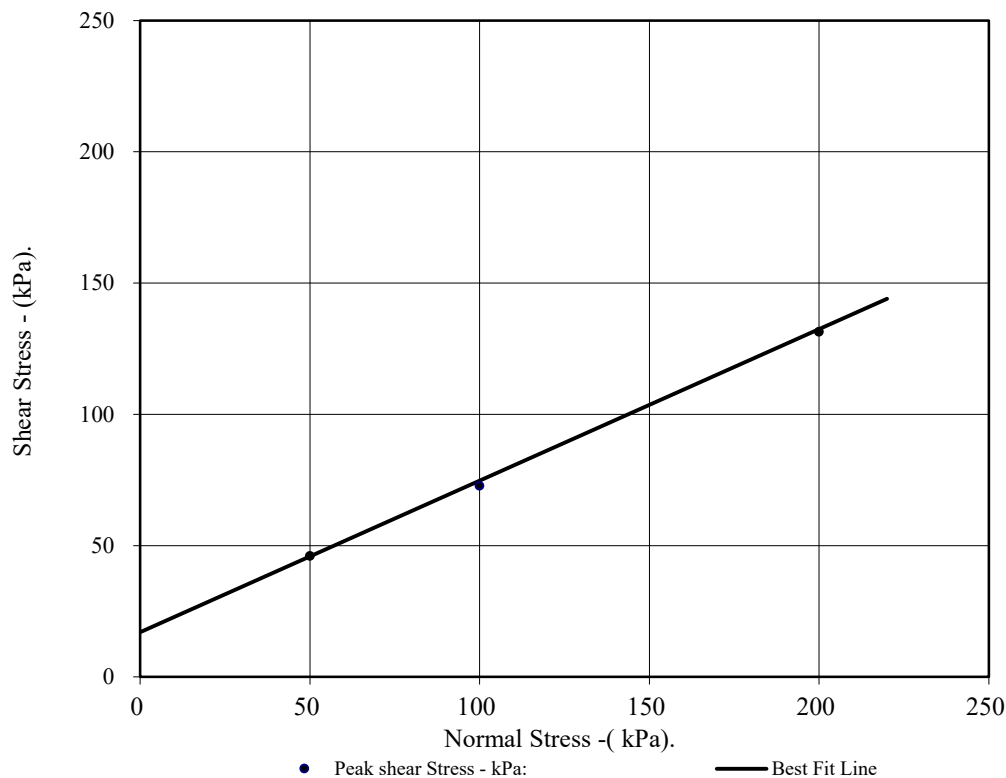
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP102		Top Depth:	6.00	
Sample Number:			Base Depth:	6.45	
Sample Conditions:	Submerged		Sample Type	U100	
Particle Density - Mg/m3:	2.65	Assumed	Remarks:		
Sample Preparation:	Cut and Trimmed Undisturbed.				
Sample Description:	See summary of soil descriptions.				
STAGE			1	2	3
Initial Conditions					
Height - mm:			20.05	20.05	20.05
Length - mm:			59.97	59.97	59.97
Moisture Content - %:			22	22	22
Bulk Density - Mg/m3:			2.08	2.07	2.08
Dry Density - Mg/m3:			1.71	1.71	1.71
Voids Ratio:			0.546	0.553	0.549
Normal Pressure- kPa			50	100	200
Consolidation Stage					
Consolidated Height - mm:			19.52	18.88	18.79
Shearing Stage					
Rate of Strain - mm/min			0.045	0.045	0.045
Displacement at peak shear stress - mm			3.31	2.11	3.01
Peak shear Stress - kPa:			46	73	131
Final Consolidated Conditions					
Moisture Content - %:			23	23	22
Bulk Density - Mg/m3:			2.14	2.20	2.22
Dry Density - Mg/m3:			1.73	1.80	1.82
Peak					
Angle of Shearing Resistance:(θ)			30		
Effective Cohesion - kPa:			17		



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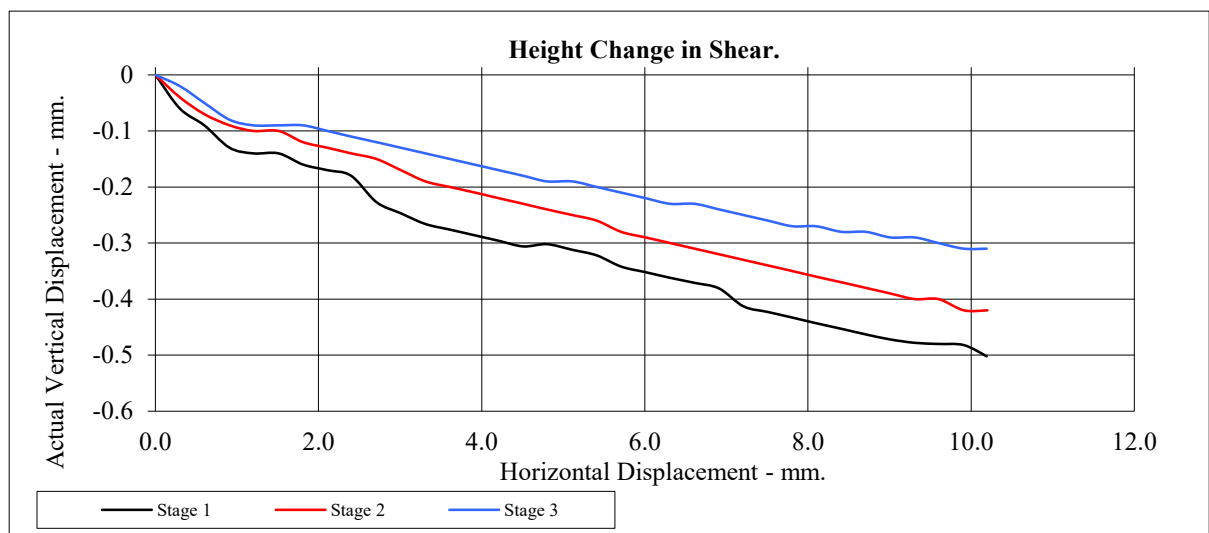
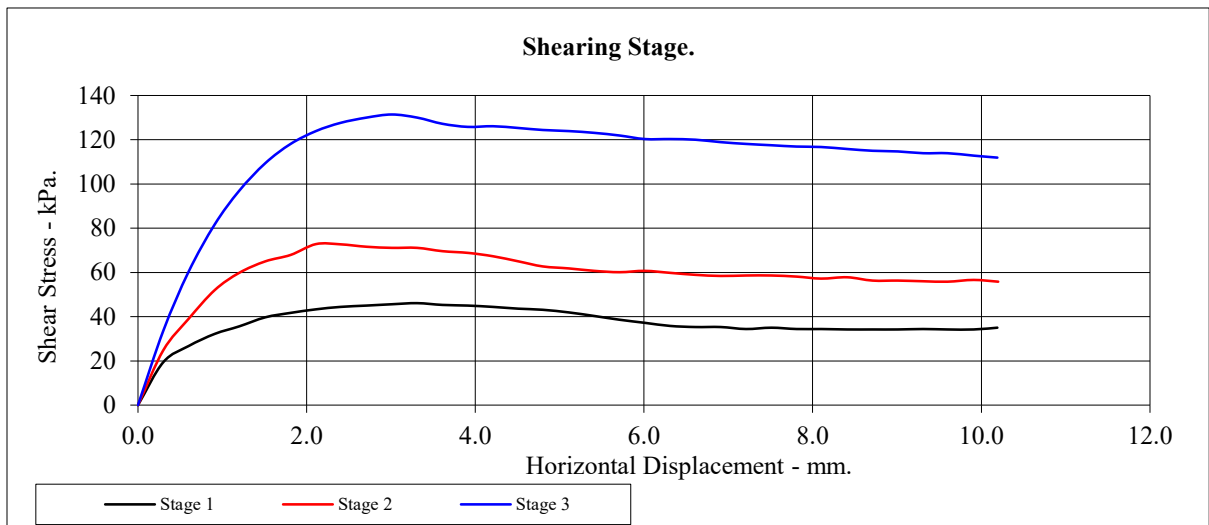
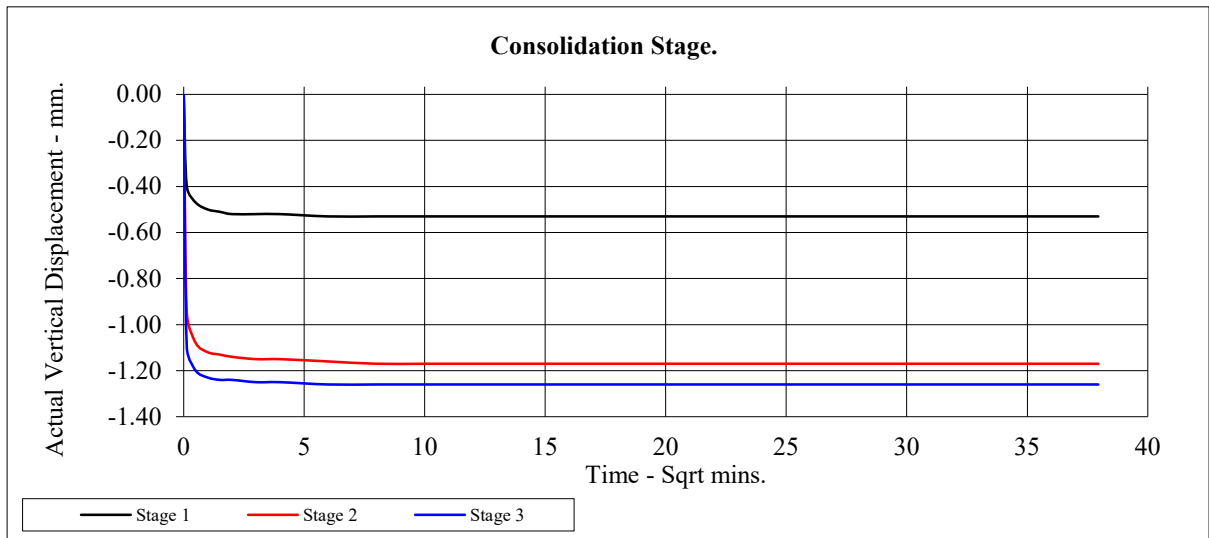
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP102	Top Depth:	6.00
Sample Number:		Base Depth:	6.45



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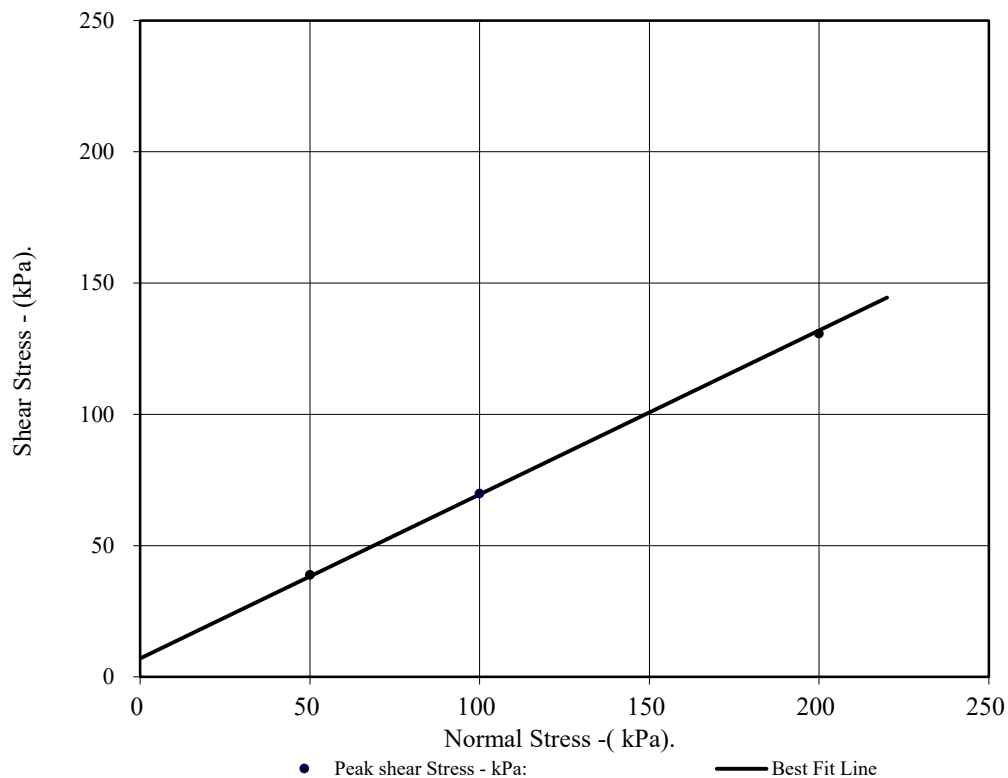
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP103		Top Depth:	6.00	
Sample Number:			Base Depth:	6.45	
Sample Conditions:	Submerged		Sample Type	U100	
Particle Density - Mg/m3:	2.65	Assumed	Remarks:		
Sample Preparation:	Cut and Trimmed Undisturbed.				
Sample Description:	See summary of soil descriptions.				
STAGE			1	2	3
Initial Conditions					
Height - mm:			20.05	20.05	20.05
Length - mm:			59.97	59.97	59.97
Moisture Content - %:			27	27	27
Bulk Density - Mg/m3:			1.97	1.98	1.98
Dry Density - Mg/m3:			1.55	1.55	1.55
Voids Ratio:			0.710	0.704	0.706
Normal Pressure- kPa			50	100	200
Consolidation Stage					
Consolidated Height - mm:			19.44	18.51	18.13
Shearing Stage					
Rate of Strain - mm/min			0.048	0.048	0.048
Displacement at peak shear stress - mm			2.11	3.61	6.01
Peak shear Stress - kPa:			39	70	131
Final Consolidated Conditions					
Moisture Content - %:			25	24	23
Bulk Density - Mg/m3:			2.03	2.14	2.19
Dry Density - Mg/m3:			1.62	1.73	1.77
Peak					
Angle of Shearing Resistance:(θ)			32		
Effective Cohesion - kPa:			7		



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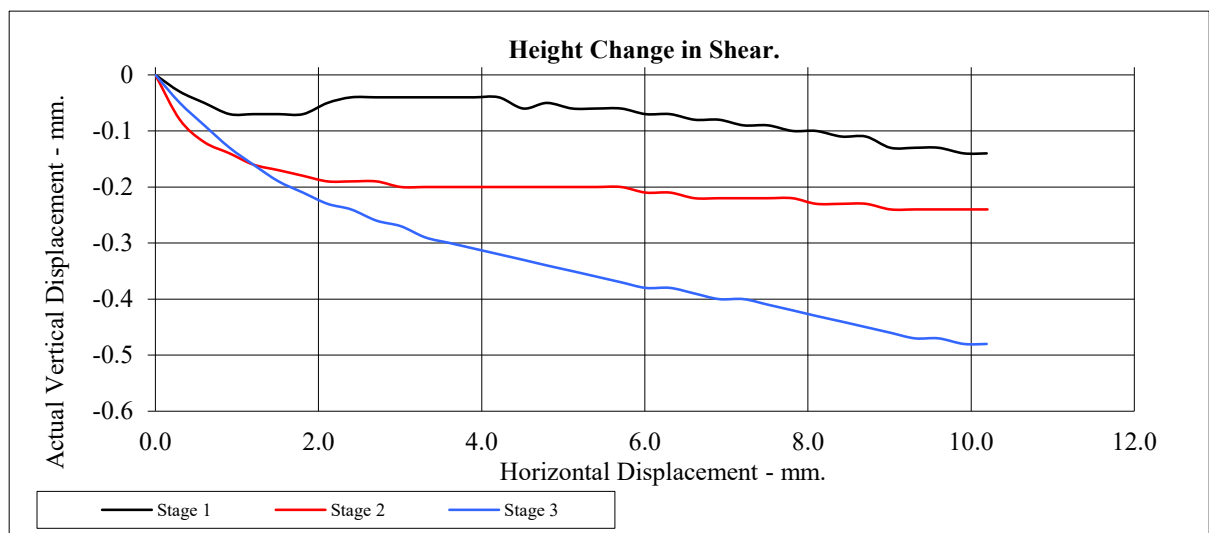
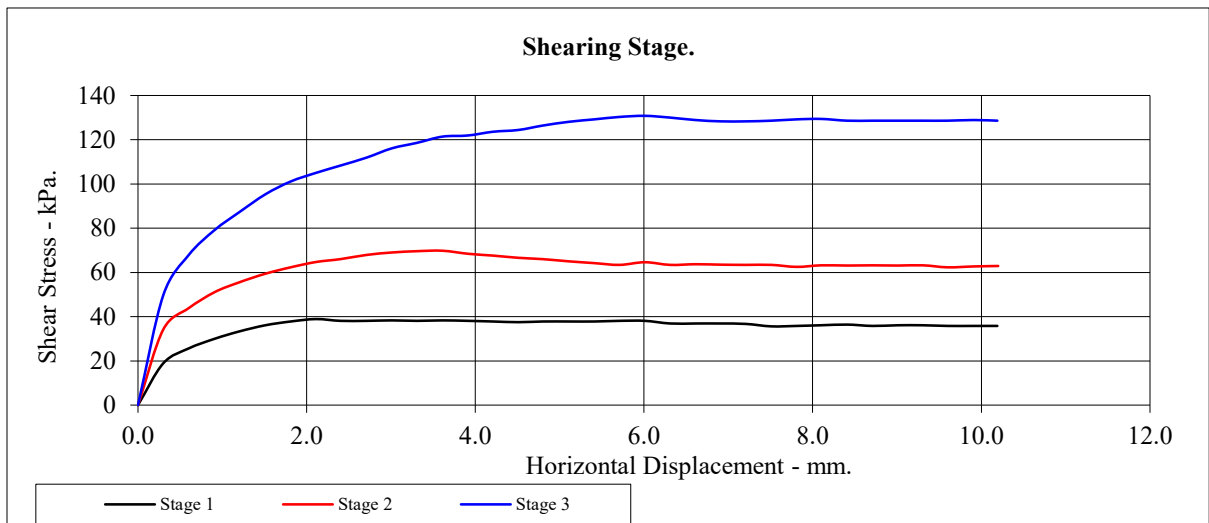
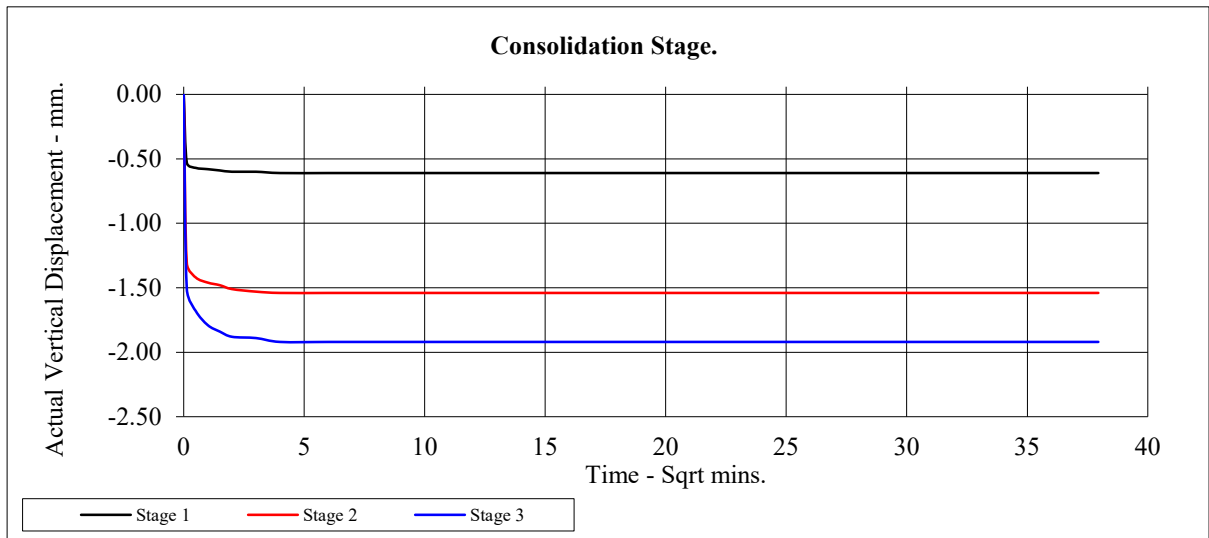
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP103	Top Depth:	6.00
Sample Number:		Base Depth:	6.45



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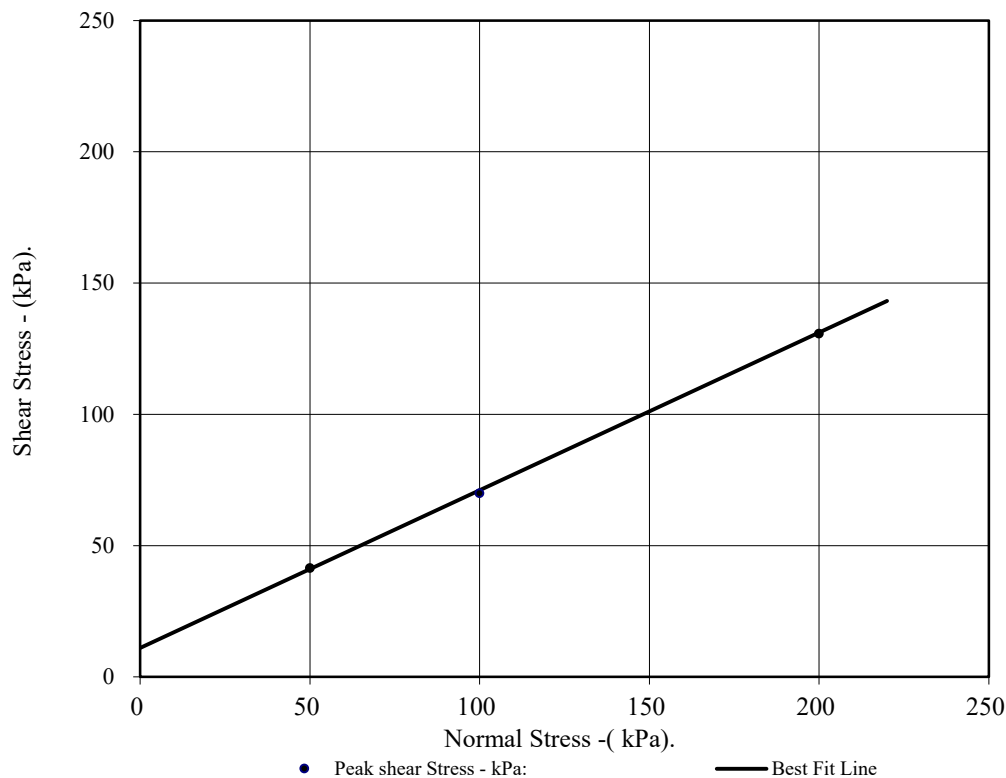
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP104		Top Depth:	5.00	
Sample Number:			Base Depth:	5.45	
Sample Conditions:	Submerged		Sample Type	U100	
Particle Density - Mg/m3:	2.65	Assumed	Remarks:		
Sample Preparation:	Cut and Trimmed Undisturbed.				
Sample Description:	See summary of soil descriptions.				
STAGE			1	2	3
Initial Conditions					
Height - mm:			20.05	20.05	20.05
Length - mm:			59.97	59.97	59.97
Moisture Content - %:			23	23	23
Bulk Density - Mg/m3:			2.01	2.01	2.01
Dry Density - Mg/m3:			1.63	1.64	1.64
Voids Ratio:			0.625	0.620	0.619
Normal Pressure- kPa			50	100	200
Consolidation Stage					
Consolidated Height - mm:			19.12	18.59	18.34
Shearing Stage					
Rate of Strain - mm/min			0.047	0.047	0.047
Displacement at peak shear stress - mm			1.81	3.92	5.41
Peak shear Stress - kPa:			41	70	131
Final Consolidated Conditions					
Moisture Content - %:			27	25	24
Bulk Density - Mg/m3:			2.11	2.17	2.20
Dry Density - Mg/m3:			1.66	1.73	1.78
Peak					
Angle of Shearing Resistance:(θ)			31		
Effective Cohesion - kPa:			11		



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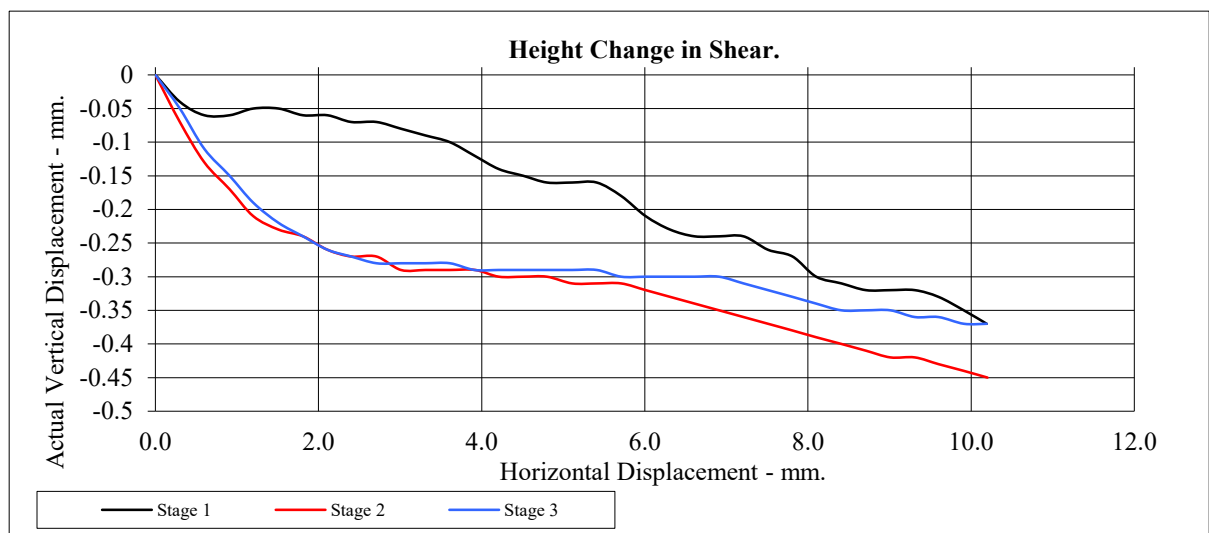
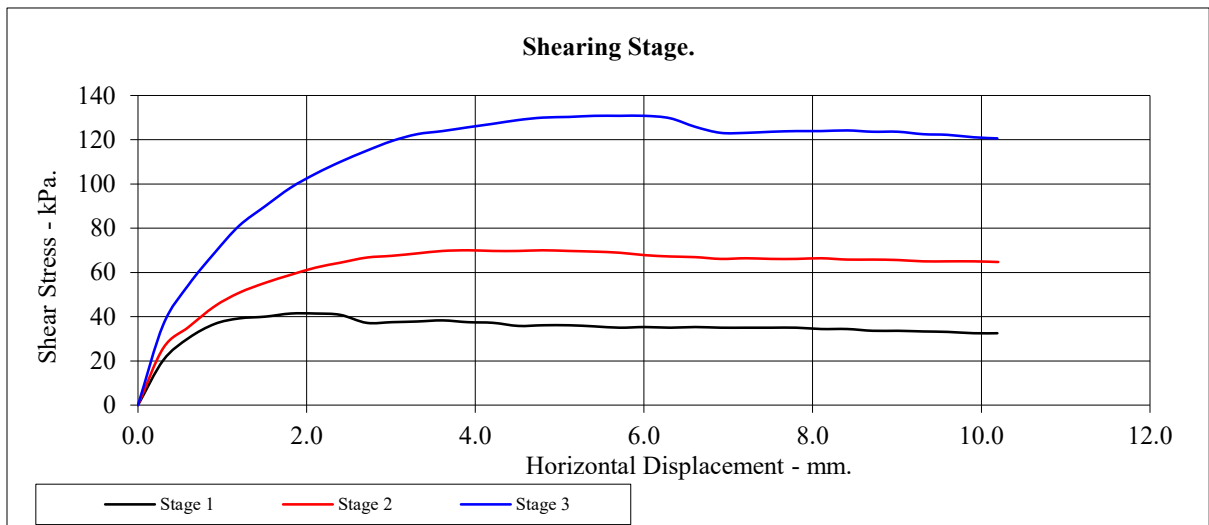
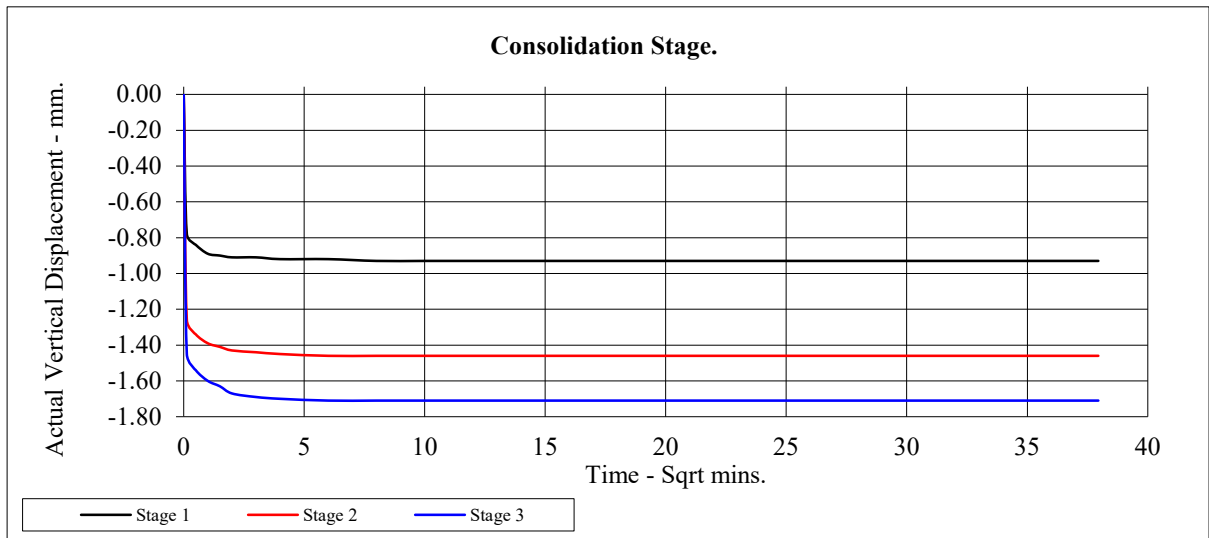
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP104	Top Depth:	5.00
Sample Number:		Base Depth:	5.45



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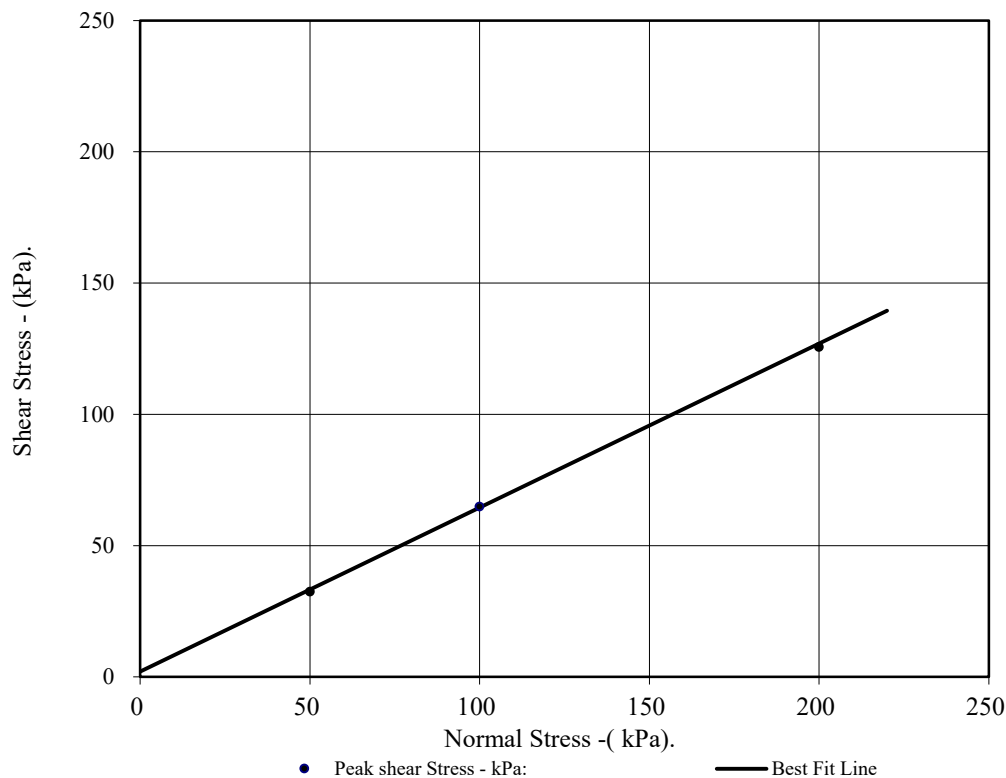
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP105		Top Depth:	5.00	
Sample Number:			Base Depth:	5.45	
Sample Conditions:	Submerged		Sample Type	U100	
Particle Density - Mg/m3:	2.65	Assumed	Remarks:		
Sample Preparation:	Cut and Trimmed Undisturbed.				
Sample Description:	See summary of soil descriptions.				
STAGE			1	2	3
Initial Conditions					
Height - mm:			20.05	20.05	20.05
Length - mm:			59.97	59.97	59.97
Moisture Content - %:			27	27	27
Bulk Density - Mg/m3:			1.93	1.92	1.92
Dry Density - Mg/m3:			1.52	1.52	1.52
Voids Ratio:			0.743	0.746	0.747
Normal Pressure- kPa			50	100	200
Consolidation Stage					
Consolidated Height - mm:			19.18	18.20	17.91
Shearing Stage					
Rate of Strain - mm/min			0.048	0.048	0.048
Displacement at peak shear stress - mm			2.71	5.41	6.01
Peak shear Stress - kPa:			33	65	126
Final Consolidated Conditions					
Moisture Content - %:			27	25	24
Bulk Density - Mg/m3:			2.01	2.12	2.15
Dry Density - Mg/m3:			1.58	1.70	1.74
Peak					
Angle of Shearing Resistance:(θ)			32		
Effective Cohesion - kPa:			2		



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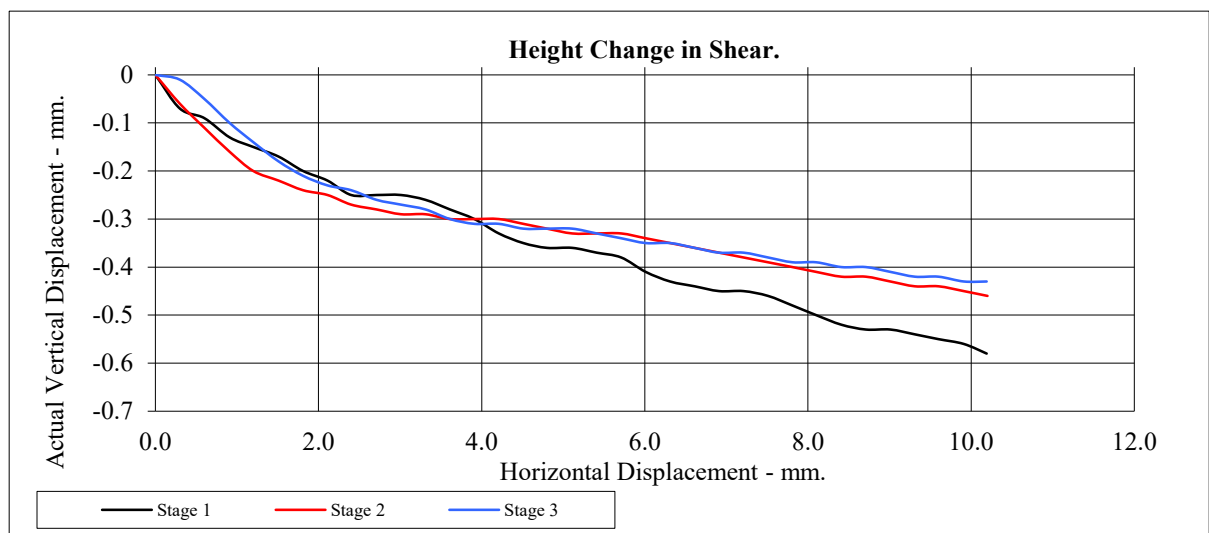
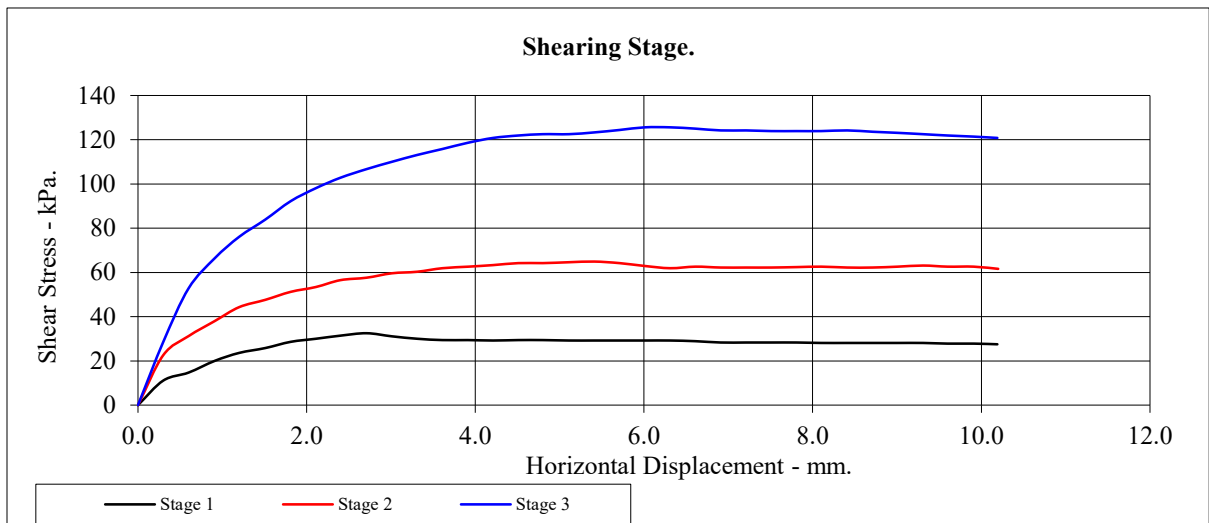
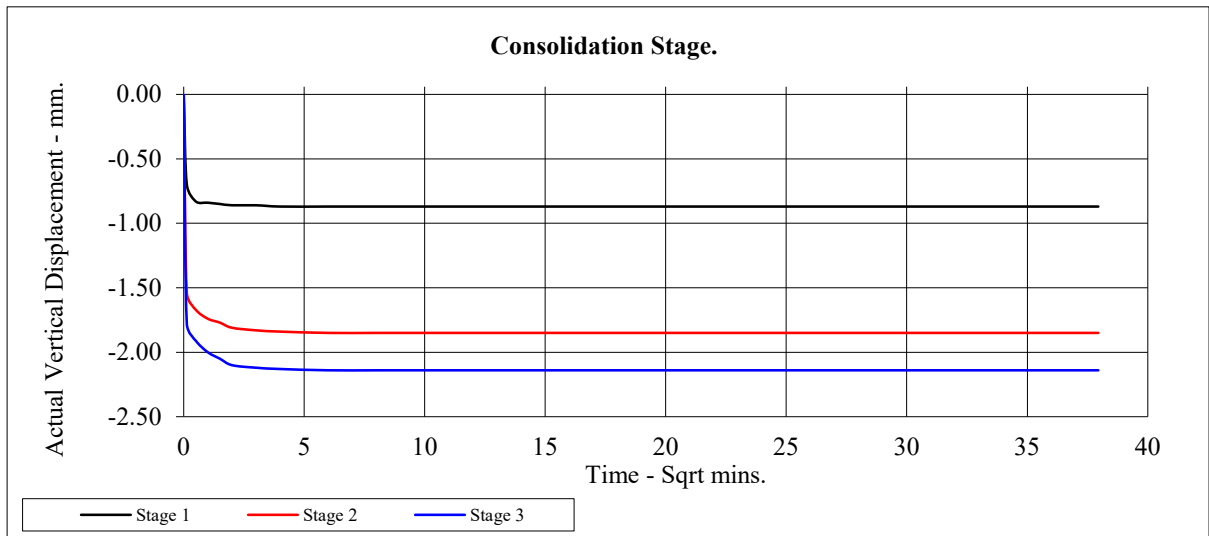
Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	CP105	Top Depth:	5.00
Sample Number:		Base Depth:	5.45



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Professional Soils Laboratory

Treetops Nursery

Contract No:
PSL21/5757
Client Ref:
A11609



2531



ANALYTICAL TEST REPORT

Contract no: 98760
Contract name: Treetops Nursery
Client reference: PSL21/5757
Clients name: Professional Soils Laboratory
Clients address: 5/7 Hexthorpe Road
Doncaster
DN4 0AR

Samples received: 26 July 2021
Analysis started: 26 July 2021
Analysis completed: 02 August 2021
Report issued: 02 August 2021

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 6 weeks from initial receipt unless otherwise instructed.

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:

Rachael Burton
Customer Support Squad Leader

Chemtech Environmental Limited

SOILS

Lab number			98760-1	98760-2	98760-3	98760-4	98760-5	98760-6
Sample id			CP101	CP101	CP101	CP102	CP102	CP102
Depth (m)			3.00-3.45	14.00-15.00	15.00-15.20	4.00-4.45	6.45-6.60	15.00-15.10
Date sampled			-	-	-	-	-	-
Test	Method	Units						
pH	CE004 ^U	units	7.8	7.1	5.7	4.9	6.2	4.8
Sulphate (2:1 water soluble)	CE061	mg/l SO ₄	<10	128	397	370	339	209

Chemtech Environmental Limited

SOILS

Lab number			98760-7	98760-8	98760-9	98760-10	98760-11	98760-12
Sample id			CP103	CP103	CP103	CP103	CP104	CP104
Depth (m)			5.00-5.45	6.00-6.45	13.50	18.00	7.50-7.70	12.00
Date sampled			-	-	-	-	-	-
Test	Method	Units						
pH	CE004 ^U	units	4.8	5.1	6.2	8.0	3.5	7.4
Sulphate (2:1 water soluble)	CE061	mg/l SO ₄	562	171	238	134	407	175

Chemtech Environmental Limited

SOILS

Lab number			98760-13	98760-14	98760-15	98760-16
Sample id			CP104	CP105	CP105	CP105
Depth (m)			21.00	5.45-5.60	9.00	10.50
Date sampled			-	-	-	-
Test	Method	Units				
pH	CE004 ^U	units	4.3	4.9	4.6	4.8
Sulphate (2:1 water soluble)	CE061	mg/l SO ₄	211	254	304	297

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	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry		10	mg/l SO ₄

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)
98760-1	CP101	3.00-3.45	Y	All (NSD)
98760-2	CP101	14.00-15.00	Y	All (NSD)
98760-3	CP101	15.00-15.20	Y	All (NSD)
98760-4	CP102	4.00-4.45	Y	All (NSD)
98760-5	CP102	6.45-6.60	Y	All (NSD)
98760-6	CP102	15.00-15.10	Y	All (NSD)
98760-7	CP103	5.00-5.45	Y	All (NSD)
98760-8	CP103	6.00-6.45	Y	All (NSD)
98760-9	CP103	13.50	Y	All (NSD)
98760-10	CP103	18.00	Y	All (NSD)
98760-11	CP104	7.50-7.70	Y	All (NSD)
98760-12	CP104	12.00	Y	All (NSD)
98760-13	CP104	21.00	Y	All (NSD)
98760-14	CP105	5.45-5.60	Y	All (NSD)
98760-15	CP105	9.00	Y	All (NSD)
98760-16	CP105	10.50	Y	All (NSD)

Attachment 4 – Photographs



Photograph 1 Showing entrance to the site facing north west.



Photograph 2 Showing site containers used as site facilities and storage.



Photograph 3 Showing west of the site, open grassland previously used as a nursery.



Photograph 4 Showing cable percussive borehole being advanced in the south of the site.