

Racquet Sports Group
c/o Temple Ford Design Ltd.

Thomas Telford House, Sun Valley Business Park
Winnall Close
Winchester
SO23 0LB

Via email only: matt@templeforddesign.co.uk

01962 673 330
soilslimited.co.uk

4th December 2020
Our Ref.: 18780/LR

Dear Matt

**Re: Warehouse Extension, Unit 3, Station Approach, North Street, Emsworth,
Hampshire PO10 7PW**

Soils Limited was commissioned to undertake an assessment of the ground conditions at the above named site in relation to an identified risk to controlled water as detailed in Soils Limited quotation reference Q23430, dated 14th September 2020.

This letter report must be read in conjunction with the following documents:

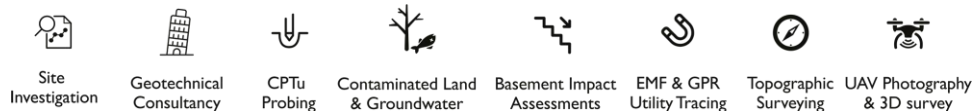
- Soils Limited Preliminary Investigation Report (Report ref.: 17974/PIR, dated December 2019)
- Soils Limited Main Investigation Report (Report ref.: 17974/MIR, dated December 2019)
- Soils Limited Supplementary Letter Report (Report ref.: 17974/LR, dated 19th June 2019)

Following on from the above investigations at the site undertaken by Soils Limited, the EHO had issued comments under APP/20/00529 (ref.: CONS/20/02053 dated 2nd September 2020) on the assessment of the site and requested further information to confirm leachability of the contaminants from the made soils. In addition, geotechnical assessment of the site indicated a piled solution was the most viable for the proposed and cable percussive drilling techniques were adopted to permit a pile design.

This letter report presents the results, discussion and conclusions to this supplementary intrusive works.

Scope of Works

In summary, the following scope of works for the supplementary intrusive investigation was agreed with the regulator and client:



Soils Limited is a limited company registered in England and Wales number 1612073. VAT number 318273558

Registered Office: Newton House, Cross Road, Tadworth, Surrey KT20 5SR

- 1No. 20m and 1no. 12m deep cable percussive boreholes with alternate SPT/U100 testing at 1m intervals for the top 5m and at 1.5m intervals thereafter (BH1 – BH2)
- Installation of 1no. up to 10m monitoring standpipe
- Geotechnical laboratory testing
- Contamination laboratory testing comprising leachate testing at approximately 1m intervals through the Made Ground.

BH1 was installed with a monitoring standpipe and BH2 was backfilled with clean arisings and bentonite and the surface reinstated with concrete to allow for continued safe use of the site.

Clean drilling techniques were adopted where advancing the boreholes through Made Ground into underlying natural soils due to the acknowledged identified potential to create contaminant pathways into the underlying secondary aquifer.

Site Works

On the 3rd and 4th November 2020, two cable percussive boreholes (BH1 – BH2) were drilled by to a depth of 20.00m and 12.00m below ground level (bgl), respectively, at locations appropriate to complement the previous intrusive investigations and provide parameters for a piled foundation scheme for the proposed development.

Alternate SPT/U100 testing was undertaken within the boreholes as appropriate at 5m intervals for the top 5m bgl and at 1.5m intervals thereafter.

A monitoring standpipe was installed within BH1 to a depth of 10.00m bgl, with response zone set within the natural soils encountered from 4.50m bgl, to allow for future groundwater monitoring and sampling, if required.

The trial hole locations have been presented in Figure 1.

All trial holes were scanned with a Cable Avoidance Tool (C.A.T.) and signal generator (Genny) prior to excavation to ensure the health and safety of the operatives.

Ground Conditions

Complete information on the ground conditions are given in the trial hole logs presented in Appendix A. The succession of conditions encountered in the trial holes is summarised below in Table 1.

Made Ground (MG)
Head (HEAD)
London Clay Formation (LCF)

Table I – Ground Conditions Summary

Strata	Epoch	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
		Top	Bottom		
MG	Anthropocene	0.00	4.50	4.50	Concrete over slightly sandy gravelly CLAY. Gravel comprised fragments of clinker, flint, brick concrete, chalk and ash.
HEAD*	Pleistocene	4.50	8.00	3.50	Dark greenish grey, greyish blue and dark brown mottled slightly gravelly slightly sandy CLAY over dark green and brown very clayey sandy GRAVEL. Gravel was angular to subangular clasts of flint.
LCF	Eocene	4.50 – 8.00	>20.00 ¹	Not proven ²	Brownish grey and grey slightly silty CLAY. Rare fine calcareous shells recorded towards upper horizon.

Note: ¹ Final depth of trial hole. ² Base of strata not encountered. 0.00 denotes ground level. * Only encountered in BH2

The full soil descriptions are given in the field logs presented in Appendix A.

The Main Investigation Report recorded Made Ground persisting to depths ranging between 2.00m bgl and the full investigatory depth of 4.00m bgl in the windowless sampler boreholes and inferred to depths of up to 5.00m bgl within the dynamic probes.

Soils of the Head were inferred underlying the Made Ground; however, the supplementary boreholes have indicated the depth to Head is variable and its presence is not continuous across the site.

Groundwater

A groundwater “strike” was recorded during the construction of BH2 at a depth of 7.00m bgl within a more granular horizon within the Head. No groundwater was recorded in BH1. The supplementary works was undertaken in November (2020) when groundwater levels are typically rising from their annual minimum (lowest) elevation, which typically occurs in September, towards their annual maximum which typically occurs in March.

Standard Penetration Tests

Standard Penetration Tests (SPTs) were undertaken in both BH1 and BH2. The derived undrained cohesion of the cohesive soils were based on the SPT “N” blow counts and derived from the relationship suggested by Stroud (1974).

The SPT “N60” values presented below have been corrected in accordance with BS EN 22476 Part 3, to account for the rig hammer efficiency, borehole depth, overburden factors etc. Further correction of the ‘N’ values should therefore not be necessary. The energy ratio of the SPT hammer was 58%.

Soils of Made Ground recorded variable SPT “N60” values of between 5 and 8.

Soils of Head Deposits, encountered underlying the Made Ground in BH2, recorded SPT “N60” values of 12 to 13, classifying the predominantly cohesive soils as medium strength with undrained cohesions of 60kPa to 65kPa.

Soils of London Clay Formation recorded SPT “N60” values between 8 and >50, classifying the cohesive soils as medium to very high strength with undrained cohesions of 40kPa to >250kPa, increasing with depth.

The unmodified SPT N values are presented on the field logs in Appendix A.

Quick Unconsolidated Undrained Triaxial Compression Tests

Three Quick Unconsolidated Undrained Triaxial Compression tests (QUU) were scheduled on three samples obtained from the London Clay Formation. One of the samples was recorded as unsuitable for testing.

The QUU testing indicated the soils of the London Clay Formation at depth were of medium becoming very high strength, with undrained cohesions of 74kPa to 295kPa.

The full laboratory report is presented in Appendix B.

Atterberg Limit Tests

Atterberg Limit tests were performed on one sample obtained from the predominantly cohesive Head and three from the London Clay Formation. The results were classified in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

The Head recorded a modified plasticity index of 27%, classifying the soils as medium volume change potential in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2. Soils obtained from the Head from the Main Investigation Report intrusive investigation were reported as low volume change potential.

The London Clay Formation recorded a modified plasticity index in the range of 37% and 48%, classifying the cohesive soils as medium to high volume change potential in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2. Therefore, a high volume change potential must be adopted.

The full results are presented within the laboratory report in Appendix B.

Particle Size Distribution Tests

A Particle Size Distribution (PSD) test was performed on one sample obtained from the more granular Head.

The PSD test classified the granular beds of the Head as having a volume change potential in accordance with BRE Digest 240, recording a fines (silt and clay) fraction of 30%.

The full results are presented within the laboratory report in Appendix B.

Sulphate and pH Tests

Two samples were taken from the Head and four from the London Clay Formation for water soluble sulphate (2:1) and pH testing.

The Head recorded water soluble sulphate between 27mg/l and 30mg/l with pH values of 7.7 to 8.0.

The London Clay Formation recorded water soluble sulphate between 194mg/l and 347 mg/l with pH values of 7.9 to 8.0.

Sulphate concentration measured in 2:1 water/soil extracts fell into Class DS-1 of the BRE Special Digest 1 2005, 'Concrete in Aggressive Ground'. Table C2 of the Digest indicated ACEC (Aggressive Chemical Environment for Concrete) site classification of AC-1.

The classification given was determined using the mobile groundwater case. The laboratory results are presented in Appendix B.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1 2005, 'Concrete in Aggressive Ground' taking into account any possible exposure of potentially pyrite bearing natural ground and the pH of the soils.

The Main Investigation Report identified that concrete specifications for the shallower soils of Made Ground and Head (<5m bgl) underlying the site fell into Class DS-1 AC-1.

Foundation Scheme – Piled Foundations into the London Clay Formation

Based on the findings of the Main Investigation Report and supplementary intrusive investigations, a piled foundation solution was considered the most viable for the proposed development, given the significant thickness of Made Ground encountered underlying the site.

Piled foundations must be taken through any Made Ground and superficial Head and into suitable strength soils of the underlying London Clay Formation, encountered directly underlying the Made Ground from 4.50m bgl in BH1, and underlying the Head from 8.00m bgl in BH2. Made Ground was inferred to depths of up to 5.00m bgl within the Main Investigation Report.

The construction of a piled foundation is a specialist job with the actual pile working load depending on the particular type pile and installation method. Prior to finalising the foundation design the advice from a reputable contractor who is familiar with the ground and groundwater conditions present at the site should be sought.

The vertical load capacities are provided for varying diameters and lengths of bored piles taken into the London Clay Formation based on SPT "N60" values and QUU results and must only be used for preliminary design purposes. These values have been calculated modelling the Head and London Clay Formation as cohesive over the full borehole length.

A factor of safety of three was applied to both the shaft and base and depicted by the design line outlined in Appendix C. An adhesion factor of 0.45m and N_c value of 9 were adopted for the clay soils.

The bearing values given in Appendix C are applicable to single piles. Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

From ground level the upper 8m of the pile shaft has been ignored in the preliminary pile design given the thickness of Made Ground and Head underlying the site.

To prevent necking of the green concrete, temporary casing may be required where the pile passes through the Made Ground, and below the groundwater table (if encountered). To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

No allowance has been made for negative skin friction that could be generated where piles pass through Made Ground and Head deposits underlying the site. The negative skin friction must be applied to the pile working load and must not be factored.

Soil Contamination vs. Groundwater

Soils chemical analysis reported within the Main Investigation Report (report ref.:17974/MIR_R27, dated December 2019) recorded marginally elevated PAH and TPH within soils of the Made Ground. Although these did not exceed commercial land-use screening criteria, chemical analysis of groundwater was recommended to quantify the risk to the underlying groundwater resource. The superficial deposits of Head are classified a Secondary A Aquifer and the underlying London Clay Formation is classified as unproductive strata. The local regional groundwater is believed to flow to the south in line with local topography over the underlying impermeable London Clay.

Subsequent to the main intrusive investigation, a Groundwater Risk Assessment was prepared for the site (report ref.:17974/LR, dated 19th June 2020) where one groundwater sample was recovered from the standpipe installed onsite in WS1 to determine whether the groundwater underlying the site had been impacted. This was the only well with groundwater present at the time of sampling.

The Groundwater Risk Assessment prepared for the site established there was no risk to the groundwater receptor as no concentrations of determinants tested within the single groundwater sample recovered were recorded in excess of their relevant Environmental Quality Standards (EQS). Notwithstanding, further testing was subsequently requested to confirm leachability of materials present within the soils of Made Ground underlying the site, as it could not be determined or confirmed whether the groundwater sampled from WS1 was representative of groundwater leaching from Made Ground, or consequent of lateral migration of groundwater through granular horizons within the Head deposits.

Soil samples were obtained from BH1 targeting soils of Made Ground at approximately 1m intervals at the southern part of the site where the impacted material was recorded, to confirm the leachability of contaminants present.

The specification for each sample tested is given in Table 2.

Table 2 – Chemical Analysis Specification

Substance	Locations:Depths (m bgl)			
	BH1:1.20^L	BH1:2.30^L	BH1:3.20^L	BH1:4.20^L
Total Phenols	✓	✓	✓	✓
TOC	✓	✓	✓	✓
pH	✓	✓	✓	✓
Metals	✓	✓	✓	✓
Metalloids	✓	✓	✓	✓
Organics	✓	✓	✓	✓

Notes: **Metals:** Cd, Cr, Pb, Hg, Ni, Se, Cu, Zn, Bo, V. **Metalloids:** As. **Organics:** Speciated PAH, EPH Texas Banded. ^L = Leachate.

The four soil leachate results from the soils of the Made Ground were compared against the Water Framework Directive (WFD) implementation in England and Wales. Where no WFD thresholds were available UK Drinking Water Standard (DWS) were used. The full laboratory report is presented in Appendix D.

The leachate analysis from this investigation recorded all determinand concentrations as being below their relevant assessment criteria. As such they cannot present a risk to underlying waters

Considering the above results and findings Soils Limited conclude that the materials underlying the proposed development area are not significantly leachable and further note that the hard capping proposed for the site will additionally significantly limit surface water infiltration. As such and given the relatively low sensitivity of the underlying Secondary A Aquifer with regards to potential potable water supplies, or any such areas with which it may be in continuity, and the confirmed mainly cohesive nature of the underlying materials, the risk to controlled waters from the Made Ground underlying the site is confirmed as being low to negligible.

The following attachments make up the remainder of this letter report.

Figure 1. Trial Hole Location Plan

Appendix A. Engineer Logs

Appendix B. Geotechnical Laboratory Testing

Appendix C. Preliminary Pile Design

Appendix D. Chemical Laboratory Testing

Should you have any further questions please do not hesitate to contact the undersigned.

Yours sincerely

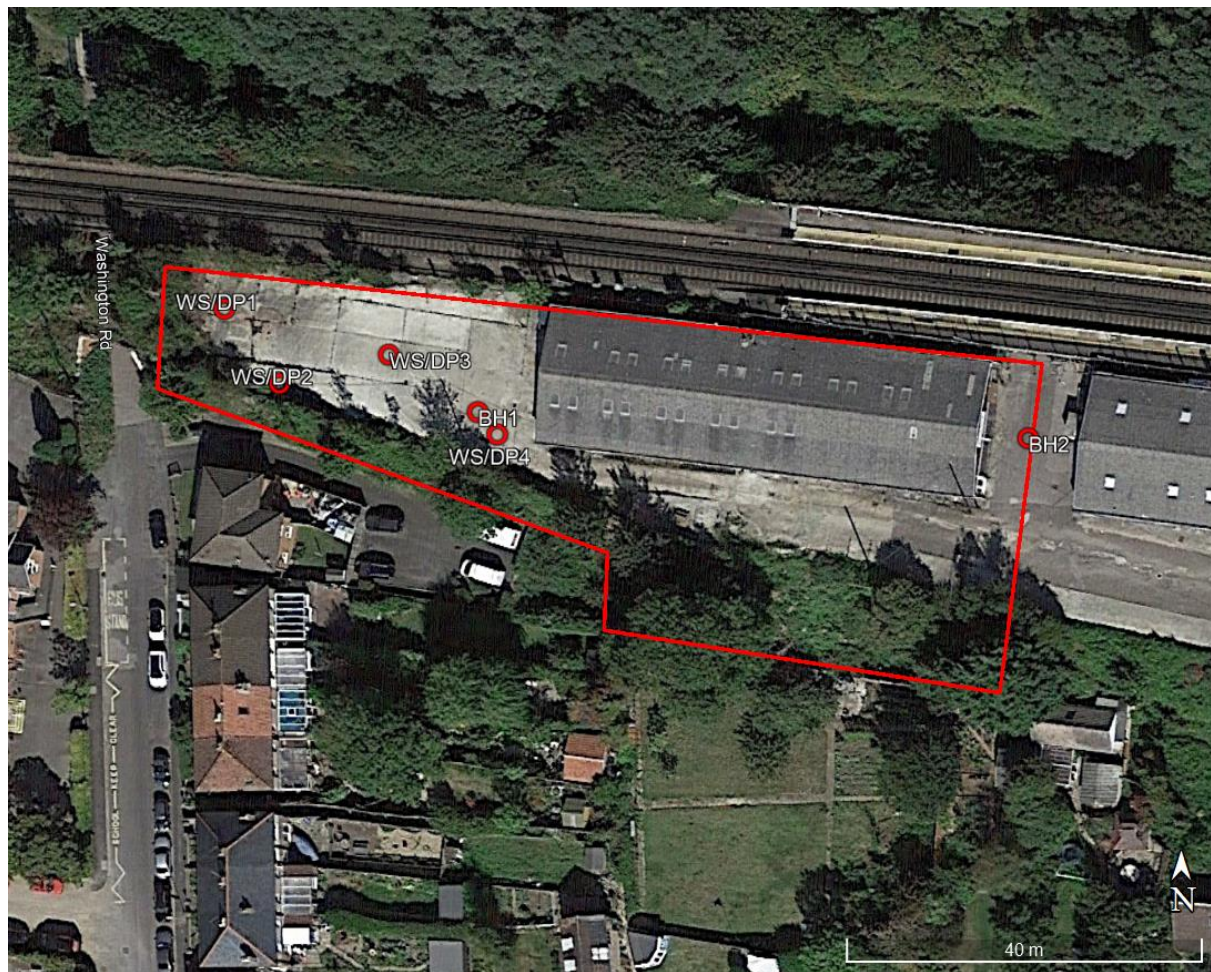
A handwritten signature in dark ink, appearing to read 'T Rudkin', with a long horizontal stroke extending to the right.

T Rudkin BSc. (Hons.), MSc., FGS.

Geo-Environmental Engineer

tr@soilslimited.co.uk

For and on behalf of Soils Limited

**Figure number**

I

Title

Trial Hole Location Plan

Project

Warehouse Extension, Unit 3 Station Approach

Date

December 2020

Client

Racquet Sports Group

Reference

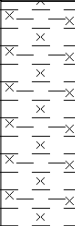
I8780/LR

Appendix A. Engineer Logs

	Contract Name: Unit 3, Station Approach				Client: Racquet Sports Group			Hole ID: BH01						
	Contract Number: 18780		Start and End Date: 03-11-20		Logged By: DW		Checked By:		Status: FINAL		Hole Type: CP			
	Easting:		Northing:		Ground Level:		Plant Used: Dando150		Print Date: 04-12-2020		Scale: 1:50			
Weather:			Termination:				SPT Hammer: N/R, Energy Ratio: N/R					Sheet 1 of 2		
Samples & In Situ Testing				Strata Details								Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description					Water Strike	Backfill/Installation		
0.00 - 0.50 0.20	B D ES	N=6 (1,1/1,2,2,1)		0.15 0.29		CONCRETE slab.					1			
0.30 0.50 - 1.00 0.70	B D ES				Red brick path. MADE GROUND.									
1.20	D ES				Dark brown sandy gravelly CLAY. Gravel is sub angular to sub rounded, fine to coarse, flint, brick, concrete, ash and clinker. MADE GROUND.									
1.50 1.50 - 1.95 1.70	SPT ES				Soft to firm, dark brown, slightly sandy, gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse clinker, flint, brick, concrete, chalk and ash. MADE GROUND.									
2.00 - 2.50	B	N=8 (2,2/2,2,2,2)		2.00		Firm, dark brown and greyish brown mottled, slightly sandy, slightly gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse brick, flint, chalk and clinker. MADE GROUND.					2			
2.30	ES				Firm, blueish grey and white mottled brown, slightly sandy, gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse chalk, flint, clinker and brick. MADE GROUND.									
2.50 2.50 - 2.95 2.50 - 3.00 2.70	SPT B ES				Firm to stiff, grey mottled brown becoming greyish brown with depth, slightly silty CLAY. Rare fine calcareous shells.									
3.20	ES				Stiff brownish grey, slightly silty CLAY. Very rare fine sand, increasing with depth.									
3.50 3.50 - 3.95 3.70	SPT ES	N=5 (1,1/2,1,1,1)		2.00							3			
4.20	ES													
4.50 4.50 - 4.95 4.50 - 5.00	SPT B	N=8 (1,1/1,2,3,2)												
5.50	D													
6.00 - 6.45	U	Ublow = 20		(3.00)							4			
7.00	D													
7.50 7.50 - 7.95 7.50 - 8.00	SPT B	N=15 (2,2/3,3,4,5)												
8.50	D													
9.00 - 9.45	U	Ublow = 35		(3.00)							5			
9.50	D													
10.00	D													
														
Start & End of Shift Observations				Borehole Diameter		Casing Diameter		Remarks:						
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Bentonite seal within Made Ground at 4.50m bgl before reducing casing diameter					
					4.50 20.00	200 150	4.50 5.50	200 150						
Chiselling				Installation				Water Strikes						
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
					0.00 5.00	5.00 10.00	PLAIN SLOTTED	50 50						
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.														

soils L I M I T E D				Contract Name: Unit 3, Station Approach				Client: Racquet Sports Group				Hole ID: BH01			
				Contract Number: 18780		Start and End Date: 03-11-20		Logged By: DW		Checked By:		Status: FINAL		Hole Type: CP	
				Easting:		Northing:		Ground Level:		Plant Used: Dando150		Print Date: 04-12-2020		Scale: 1:50	
Weather:				Termination:				SPT Hammer: N/R, Energy Ratio: N/R				Sheet 2 of 2			
Samples & In Situ Testing					Strata Details								Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation		
10.50 10.50 - 10.95	SPT	N=19 (2,3/4,5,5,5)		10.50		Stiff brownish grey, slightly silty CLAY. Very rare fine sand, increasing with depth.									
						Stiff brownish grey, slightly silty sandy CLAY. Sand is fine. Rare coarse sand sized calcareous shells.						11			
11.50	D														
12.00 - 12.45	U	Ublow = 55										12			
12.50	D														
13.00	D											13			
13.50 13.50 - 13.95	SPT	N=42 (5,7/9,9,12,12)										14			
14.50	D														
15.00 - 15.45	U	Ublow = 65										15			
15.50	D														
16.00	D											16			
16.50 16.50 - 16.95	SPT	N=47 (6,8/9,10,13,15)										17			
17.50	D														
18.00 - 18.45	U	Ublow = 80										18			
18.50	D														
19.00	D											19			
19.50 19.50 - 19.95	SPT	50 (9,14/50 for 170mm)													
				20.00		End of Borehole at 20.00m						20			
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:						
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Bentonite seal within Made Ground at 4.50m bgl before reducing casing diameter						
					4.50 20.00	200 150	4.50 5.50	200 150							
									Water Strikes						
Chiselling					Installation				Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)							
					0.00 5.00	5.00 10.00	PLAIN SLOTTED	50 50							
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.															

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)						
					4.50	200	4.50	200						
					12.50	150	7.50	150						
					Water Strikes									
Chiselling					Installation				Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	7.00			0	0.00	
									Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.					

	Contract Name: Unit 3, Station Approach				Client: Racquet Sports Group				Hole ID: BH02					
	Contract Number: 18780		Start and End Date: 04-11-20		Logged By: DW		Checked By:		Status: FINAL		Hole Type: CP			
	Easting:		Northing:		Ground Level:		Plant Used: Dando151		Print Date: 04-12-2020		Scale: 1:50			
Weather:			Termination:				SPT Hammer: N/R, Energy Ratio: N/R				Sheet 2 of 2			
Samples & In Situ Testing					Strata Details							Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/ Installation	
10.50 10.50 - 10.95	SPT	N=27 (4,5/6,6,7,8)				Stiff brownish grey, slightly silty CLAY. Very rare fine sand, increasing with depth.						11		
11.50	D			11.50		Stiff brownish grey, slightly silty sandy CLAY. Sand is fine. Rare coarse sand sized calcareous shells.						12		
12.00 - 12.45	U	Ublow = 65		(1.00)								13		
12.50	D			12.50		End of Borehole at 12.50m						14		
												15		
												16		
												17		
												18		
												19		
												20		
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Bentonite seal within Made Ground at 4.50m bgl before reducing casing diameter					
					4.50	200	4.50	200						
					12.50	150	7.50	150						
Chiselling					Installation				Water Strikes					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
									7.00			0	0.00	
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.														

Appendix B. Geotechnical Laboratory Testing



Contract Number: 51240

Client Ref: **18780**

Report Date: **27-11-2020**

Client PO: **18780**

Client **Soils Limited**
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

Contract Title: **Unit 3 Station Approach**
For the attention of: **Tim Rudkin**

Date Received: **11-11-2020**

Date Completed: **27-11-2020**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	4
1 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.4 & 5.3 - * UKAS	4
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	1
Quick Undrained Triaxial Compression test - single specimen at one confining pressure (100mm or 38mm diameter) BS 1377:1990 - Part 7 : 8 - * UKAS	2
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

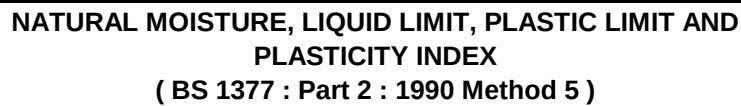
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

Emma Sharp (Office Manager/Director) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)

Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

[illegible]



**PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2**

Contract Number **51240**

Borehole/Pit No. **BH2**

Site Name **Unit 3 Station Approach**

Sample No.

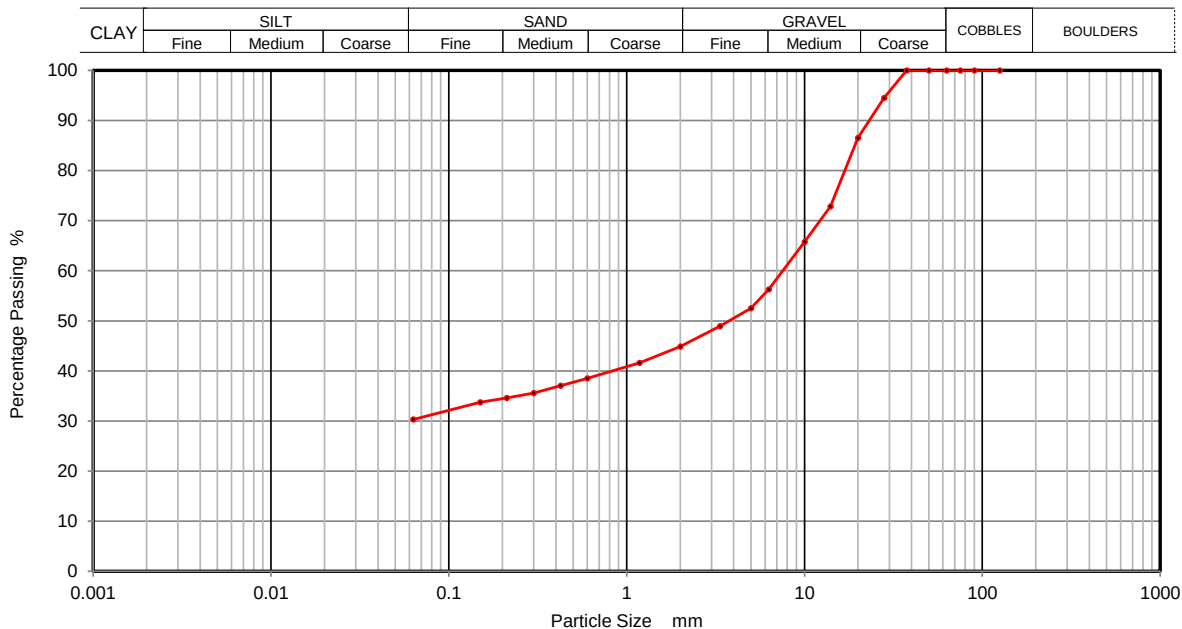
Soil Description **Brown fine to ocase sandy silty/ clayey fine to coare GRAVEL**

Depth Top **7.00**

Depth Base **7.50**

Date Tested **20/11/2020**

Sample Type **B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	87		
14	73		
10	66		
6.3	56		
5	53		
3.35	49		
2	45		
1.18	42		
0.6	38		
0.425	37		
0.3	36		
0.212	35		
0.15	34		
0.063	30		

Sample Proportions	% dry mass
Cobbles	0
Gravel	55
Sand	15
Silt and Clay	30

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	26/11/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	27/11/2020	Paul Evans	<i>P. Evans</i>



2788



Single Stage Unconsolidated-Undrained Triaxial Test
BS 1377 : 1990 Part 7 : 8

Contract Number 51240

Borehole/Pit No. BH1

Site Name Unit 3 Station Approach

Sample No.

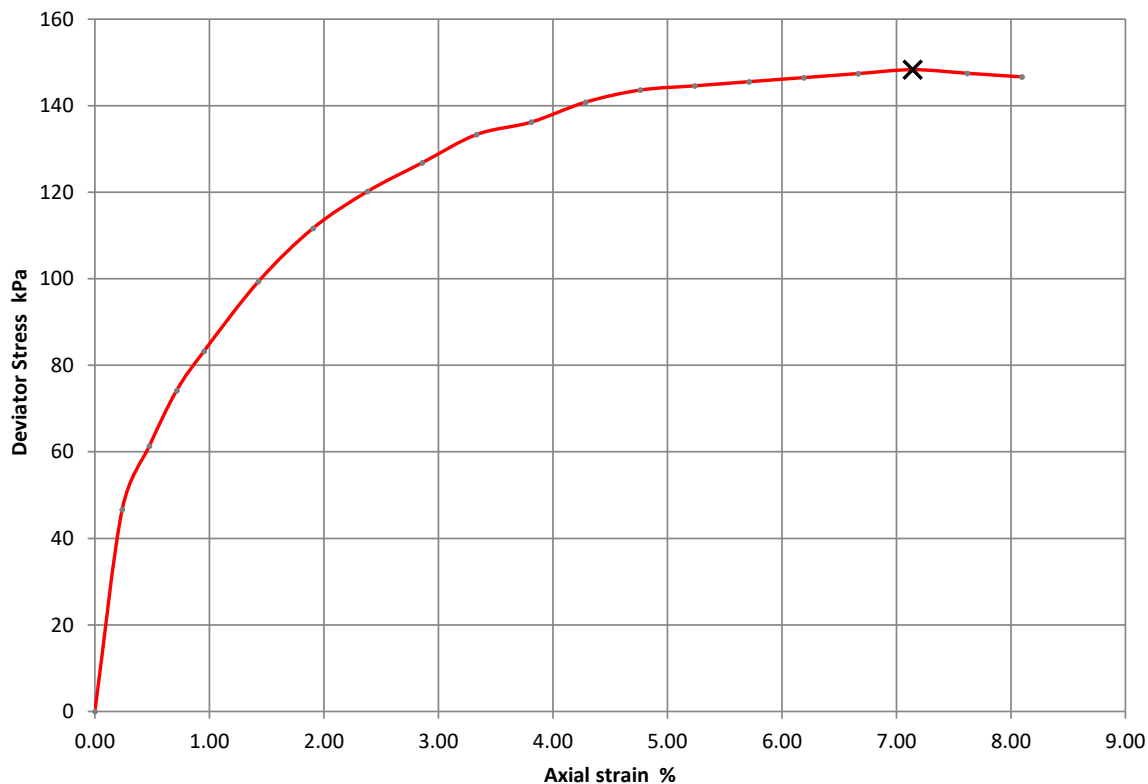
Soil Description Brown silty CLAY

Depth Top (m) 9.00

Depth Base (m) 9.45

Date Tested 18/11/2020

Sample Type U



Moisture Content (%)	26
Bulk Density (Mg/m ³)	1.89
Dry Density (Mg/m ³)	1.50
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	180
Deviator Stress (kPa)	148
Undrained Shear Strength (kPa)	74
Failure Strain (%)	7
Mode Of Failure	Brittle
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43

Specimen Post Test



Sample Split



Checked	26/11/2020	Emma Sharp	
Approved	27/11/2020	Paul Evans	





Single Stage Unconsolidated-Undrained Triaxial Test
BS 1377 : 1990 Part 7 : 8

Contract Number 51240

Borehole/Pit No. BH1

Site Name Unit 3 Station Approach

Sample No.

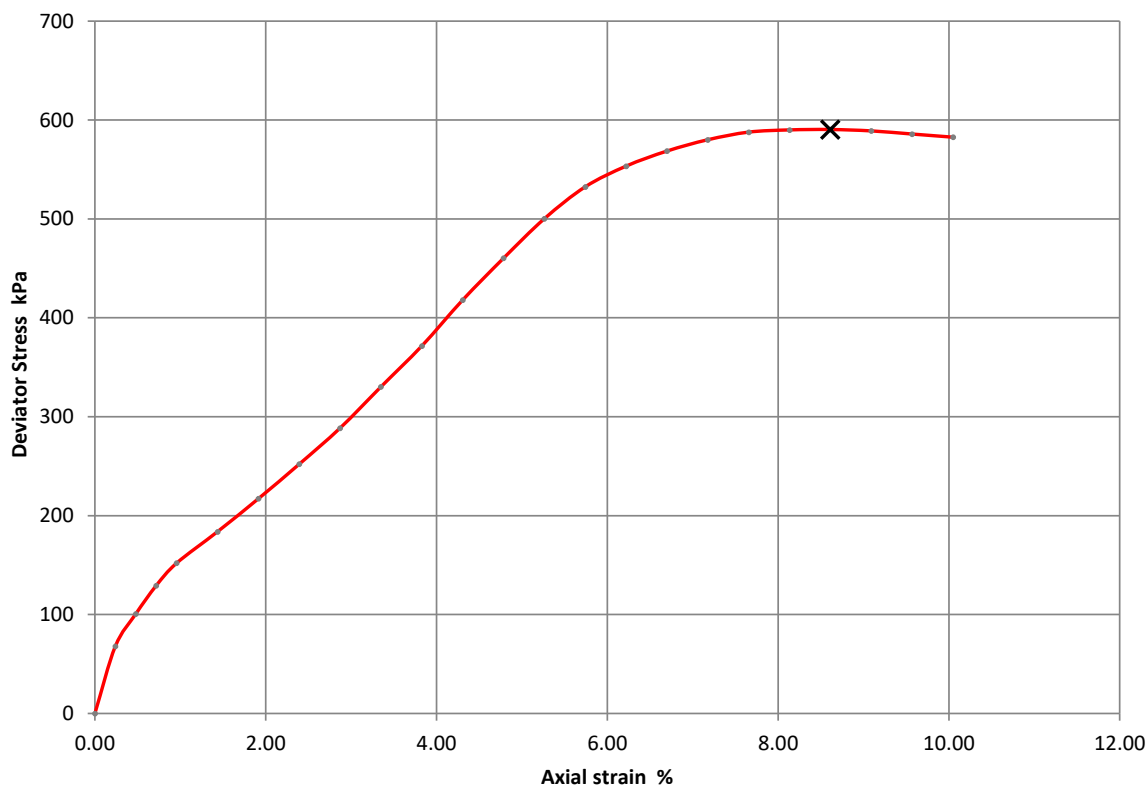
Soil Description Brown silty CLAY

Depth Top (m) 12.00

Depth Base (m) 12.45

Date Tested 18/11/2020

Sample Type U

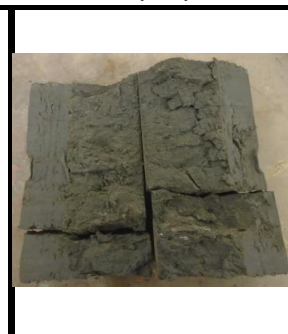


Moisture Content (%)	16
Bulk Density (Mg/m ³)	2.11
Dry Density (Mg/m ³)	1.81
Specimen Length (mm)	209
Specimen Diameter (mm)	103
Cell Pressure (kPa)	240
Deviator Stress (kPa)	590
Undrained Shear Strength (kPa)	295
Failure Strain (%)	9
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.44

Specimen Post Test



Sample Split



Checked	26/11/2020	Emma Sharp	
Approved	27/11/2020	Paul Evans	





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DETS Report No: 20-13204

Site Reference: Unit 3 Station Approach

Project / Job Ref: 18780

Order No: 18780

Sample Receipt Date: 10/11/2020

Sample Scheduled Date: 10/11/2020

Report Issue Number: 1

Reporting Date: 16/11/2020

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

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Soil Analysis Certificate						
DETS Report No: 20-13204	Date Sampled	03/11/20	03/11/20	03/11/20	03/11/20	04/11/20
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Unit 3 Station Approach	TP / BH No	BH1	BH1	BH1	BH1	BH2
Project / Job Ref: 18780	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 18780	Depth (m)	5.50	8.50	12.50	18.50	5.50
Reporting Date: 16/11/2020	DETS Sample No	509810	509811	509812	509813	509814

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	8.0	8.0	8.0	7.9	7.7
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	177	347	207	194	27
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.18	0.35	0.21	0.19	0.03

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
 Subcontracted analysis (S)



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Soil Analysis Certificate						
DETS Report No: 20-13204	Date Sampled	04/11/20				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Unit 3 Station Approach	TP / BH No	BH2				
Project / Job Ref: 18780	Additional Refs	None Supplied				
Order No: 18780	Depth (m)	7.50				
Reporting Date: 16/11/2020	DETS Sample No	509815				

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	MCERTS	8.0			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	30			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.03			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)



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Soil Analysis Certificate - Sample Descriptions

DETS Report No: 20-13204	
Soils Ltd	
Site Reference: Unit 3 Station Approach	
Project / Job Ref: 18780	
Order No: 18780	
Reporting Date: 16/11/2020	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
509810	BH1	None Supplied	5.50	15.2	Brown clay
509811	BH1	None Supplied	8.50	16.7	Brown clay
509812	BH1	None Supplied	12.50	13.2	Brown clayey sand
509813	BH1	None Supplied	18.50	13.9	Brown clayey sand
509814	BH2	None Supplied	5.50	17	Brown clayey sand
509815	BH2	None Supplied	7.50	20.2	Brown clayey sand

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{1/5}

Unsuitable Sample ^{1/5}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 20-13204

Soils Ltd

Site Reference: Unit 3 Station Approach

Project / Job Ref: 18780

Order No: 18780

Reporting Date: 16/11/2020

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphencylcarbazine followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

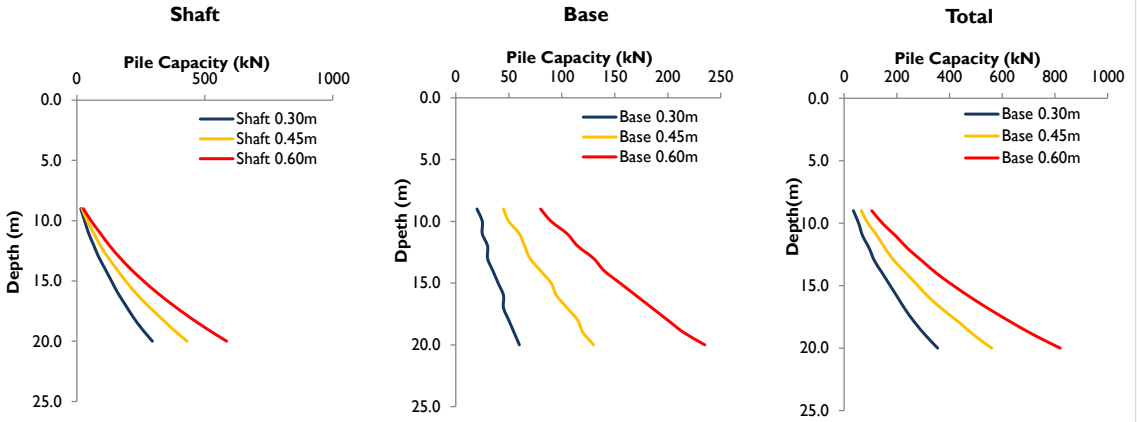
D Dried
AR As Received

Appendix C. Preliminary Pile Design

Preliminary Pile Working Loads

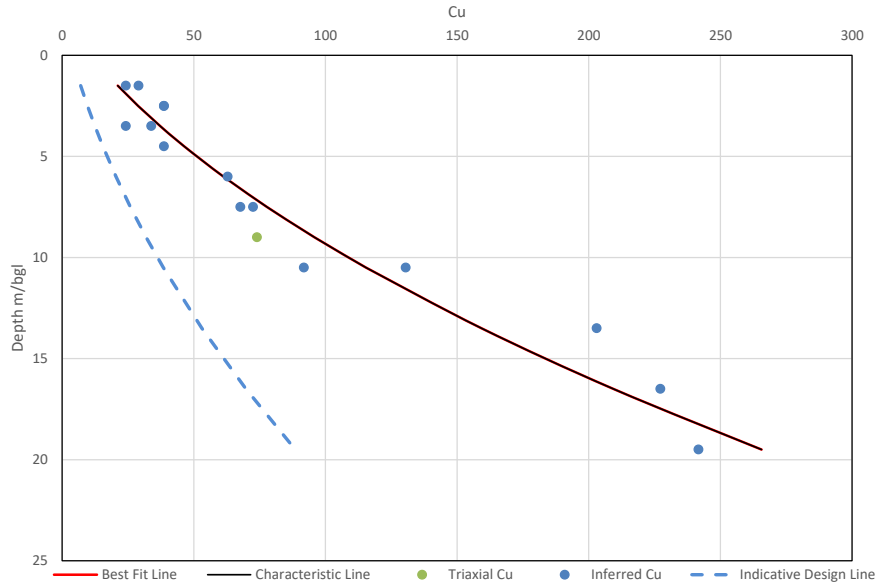
Single Vertically Loaded Pile (kN)

Name:	TR	N _c value	9	Pile Start Depth:	8	FOS	
Job No:	18780	α value:	0.45	Pile Final Depth:	20	Shaft	Base
Date:	1.12.20			Pile Increment:	1	3	3



Pile Diameter (m):

Pile Depths	0.30			0.45			0.60		
(m bgl)	Shaft	Base	Total	Shaft	Base	Total	Shaft	Base	Total
8.0									
9.0	15	20	35	20	45	65	25	80	105
10.0	30	25	55	40	50	90	55	90	145
11.0	45	25	70	65	60	125	90	105	195
12.0	65	30	95	90	65	155	125	115	240
13.0	85	30	115	120	70	190	165	130	295
14.0	110	35	145	155	80	235	210	140	350
15.0	135	40	175	190	90	280	260	155	415
16.0	160	45	205	230	95	325	315	170	485
17.0	190	45	235	275	105	380	375	185	560
18.0	220	50	270	325	115	440	440	200	640
19.0	255	55	310	375	120	495	510	215	725
20.0	295	60	355	430	130	560	585	235	820



Appendix D. Chemical Laboratory Results



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DETS Report No: 20-13071

Site Reference: Unit 3 Station Approach

Project / Job Ref: 18780

Order No: 18780

Sample Receipt Date: 06/11/2020

Sample Scheduled Date: 06/11/2020

Report Issue Number: 1

Reporting Date: 12/11/2020

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

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Leachate Analysis Certificate						
DETS Report No: 20-13071	Date Sampled	03/11/20	03/11/20	03/11/20	03/11/20	
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Unit 3 Station Approach	TP / BH No	BH1	BH1	BH1	BH1	
Project / Job Ref: 18780	Additional Refs	1.20	2.30	3.20	4.20	
Order No: 18780	Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	
Reporting Date: 12/11/2020	DETS Sample No	509107	509108	509109	509110	

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	ISO17025	8.7	8.4	8.6	9.9
Total Organic Carbon (TOC)	mg/l	< 0.1	NONE	1.9	3.8	0.5	1.5
Arsenic	ug/l	< 5	ISO17025	6	< 5	< 5	6
Boron	ug/l	< 5	ISO17025	7	21	12	37
Cadmium	ug/l	< 0.4	ISO17025	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	ug/l	< 5	ISO17025	< 5	< 5	< 5	< 5
Chromium (hexavalent)	ug/l	< 20	NONE	< 20	< 20	< 20	< 20
Copper	ug/l	< 5	ISO17025	< 5	< 5	< 5	7
Lead	ug/l	< 5	ISO17025	< 5	< 5	< 5	< 5
Mercury	ug/l	< 0.05	ISO17025	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	ug/l	< 5	ISO17025	< 5	< 5	< 5	< 5
Selenium	ug/l	< 5	ISO17025	< 5	< 5	< 5	< 5
Vanadium	ug/l	< 5	ISO17025	5	< 5	< 5	13
Zinc	ug/l	< 2	ISO17025	< 2	< 2	< 2	< 2
Total Phenols (monohydric)	ug/l	< 10	NONE	< 10	< 10	< 10	< 10

Subcontracted analysis ⁽⁵⁾



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Leachate Analysis Certificate - Speciated PAH						
DETS Report No: 20-13071	Date Sampled	03/11/20	03/11/20	03/11/20	03/11/20	
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Unit 3 Station Approach	TP / BH No	BH1	BH1	BH1	BH1	
Project / Job Ref: 18780	Additional Refs	1.20	2.30	3.20	4.20	
Order No: 18780	Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	
Reporting Date: 12/11/2020	DETS Sample No	509107	509108	509109	509110	

Determinand	Unit	RL	Accreditation					
Naphthalene	ug/l	< 0.01	NONE	0.05	0.02	0.02	< 0.01	
Acenaphthylene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Acenaphthene	ug/l	< 0.01	NONE	0.02	0.04	< 0.01	< 0.01	
Fluorene	ug/l	< 0.01	NONE	0.01	0.03	< 0.01	< 0.01	
Phenanthrene	ug/l	< 0.01	NONE	0.05	0.10	0.02	< 0.01	
Anthracene	ug/l	< 0.01	NONE	0.01	0.02	< 0.01	< 0.01	
Fluoranthene	ug/l	< 0.01	NONE	0.06	0.05	0.01	< 0.01	
Pyrene	ug/l	< 0.01	NONE	0.05	0.04	0.01	< 0.01	
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01	0.01	< 0.01	< 0.01	
Chrysene	ug/l	< 0.01	NONE	< 0.01	0.02	< 0.01	< 0.01	
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Benzo(ghi)perylene	ug/l	< 0.008	NONE	< 0.008	< 0.008	< 0.008	< 0.008	
Total EPA-16 PAHs	ug/l	< 0.01	NONE	0.25	0.33	0.06	< 0.01	



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Leachate Analysis Certificate - EPH Texas Banded						
DETS Report No: 20-13071	Date Sampled	03/11/20	03/11/20	03/11/20	03/11/20	
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Unit 3 Station Approach	TP / BH No	BH1	BH1	BH1	BH1	
Project / Job Ref: 18780	Additional Refs	1.20	2.30	3.20	4.20	
Order No: 18780	Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	
Reporting Date: 12/11/2020	DETS Sample No	509107	509108	509109	509110	

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	ug/l	< 10	NONE	< 10	< 10	< 10	< 10	< 10
EPH Texas (>C8 - C10)	ug/l	< 10	NONE	< 10	< 10	< 10	< 10	< 10
EPH Texas (>C10 - C12)	ug/l	< 10	NONE	< 10	< 10	< 10	< 10	< 10
EPH Texas (>C12 - C16)	ug/l	< 10	NONE	< 10	< 10	< 10	< 10	< 10
EPH Texas (>C16 - C21)	ug/l	< 10	NONE	< 10	< 10	< 10	< 10	< 10
EPH Texas (>C21 - C40)	ug/l	< 10	NONE	< 10	< 10	< 10	< 10	< 10
EPH Texas (C6 - C40)	ug/l	< 10	NONE	< 10	< 10	< 10	< 10	< 10



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Water Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 20-13071

Soils Ltd

Site Reference: Unit 3 Station Approach

Project / Job Ref: 18780

Order No: 18780

Reporting Date: 12/11/2020

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO ₄)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, C34-C40, C40-C44, C44-C48, C48-C52, C52-C56, C56-C60, C60-C64, C64-C68, C68-C72, C72-C76, C76-C80, C80-C84, C84-C88, C88-C92, C92-C96, C96-C100)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, C44-C48, C48-C52, C52-C56, C56-C60, C60-C64, C64-C68, C68-C72, C72-C76, C76-C80, C80-C84, C84-C88, C88-C92, C92-C96, C96-C100)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered