GEOLOGICAL
GEOTECHNICAL
GEOENVIRONMENTAL
DATA ACQUISITION
CONSULTANCY

Intrusive Site Investigation Report

LOCATION	Proposed Development – Land at Dentholme, Cragg Road, Cleator Moor CA25 5PR
ISSUE DATE	May 2021
FOR	Monoux Building Consultants Ltd
CLIENT REF.	
OUR REF.	G21044

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1. Introduction

Following your instruction, Geoinvestigate Ltd carried out an Intrusive Investigation at Dentholme, Cragg Road, Cleator Moor CA25 5PR.

The purpose of the Phase 2 investigation was to establish the nature of the ground conditions at the site for foundation design and to assess any geotechnical hazards and the potential contamination to occur at the site. No Phase 1 Desk Study was produced prior to this report.

The site comprises a current building and surrounding grassed areas.

No formal Phase 1 Desk Study has been compiled for the site as none was requested by the client.

2. Scope of Phase 2 Investigation

2.1 Scope of Works

It has been concluded that the following investigation would be appropriate to assess the potential geotechnical and contamination risks at the site:

- The sinking of two (2) boreholes (ref Nos. BH1 – BH2) to depths of up to 4.00m within or close to the proposed footprint of the structures with associated soil sampling and supervision of the works by a suitably qualified geo-environmental engineer. The boreholes were sunk by windowless sampling drilling techniques using a Dando Terrier drill rig.

- The sinking of a further windowless sampling borehole (BHA) to allow for infiltration testing to be carried out by way of falling head testing within the borehole.

- Excavation of four (4) hand-dug trial pits (TPA to TPD) to further inspect the depth and condition of the current foundations of the building present on site

- Geotechnical Testing comprising two (2) Atterberg Limits tests and thirteen (13) moisture determinations to provide information with regard to soil plasticity on the site.

- Contamination analyses of two (2) samples of near surface soils recovered from depths of up to 0.50m at the site to assess pH and water-soluble sulphate concentrations.

- Provision of a factual and interpretative report including; site plan, borehole logs, trial pit logs, geotechnical and soil analysis results, and advice on suitable foundation types.

No Phase 1 Desk Study has been compiled prior to this investigation. The borehole and trial pit positions are shown on the plans provided in Appendix 1.

The excavations were sampled and logged at site by a geo-environmental engineer and the ground conditions encountered are described on the borehole logs also provided in Appendix 1.

The results of the contamination testing are included in Chemtech Report 95677 in Appendix 2.

2.2 Sampling Rationale

The Dando Terrier boreholes (BH1 to BH2) were sunk near to the proposed building at the south of the site give an indication of the ground conditions around the footprint of the proposed structure. Another borehole was sunk for the undertaking of a soakaway test to the north of the existing building. Trial pits were sunk around the most northern part of the existing building to expose foundations.

3. Phase 2 Findings

3.1 Encountered Ground Conditions

It was anticipated from a review of BGS mapping that the site would be underlain by Devensian Till (Diamicton) with bedrock geology of Buttermere Formation (Mudstone and Sandstone).

A brief view of the historical usage of site shows the area is undeveloped, used for some time as agricultural land. The adjacent residential developments and on-site development may be the most likely cause of contamination.

3.1.1 Windowless Sampling Boreholes

The windowless sampling boreholes at the site encountered conditions of made ground to variable depths then natural sand and clay strata.

3.1.1.1– Windowless Sampling Boreholes – BH1 to BH2

BH1 encountered turf and topsoil of soft sandy gravelly clay with gravel of sandstone and pot to 0.20m followed by made ground of soft sandy gravelly clay with gravel of sandstone, mudstone and slag to 0.60m. A strong sulphurous smell was noted from 0.20m to 0.40m. This was underlain by natural soft to firm sandy very gravelly clay to termination at 3.20m

Shear vane testing in the clayey strata returned values of 15kN/m^2 at 0.50m, 30kN/m^2 at 1.00m and 40kN/m^2 at 1.50m

In-situ SPT Testing (carried out with a solid cone sampler) was undertaken in the more granular strata with values of N=8 at 1.00m, N=16 at 2.00m and N=29 at 3.00m.

BH2 encountered turf and topsoil soft slightly sandy gravelly clay with gravel of sandstone and tarmac to 0.25m followed by made ground of soft to firm slightly sandy gravelly clay with gravel of sandstone and brick to 1.00m. This was underlain by soft to firm slightly sandy gravelly clay, becoming very gravelly from 1.60m, to termination at 4.00m. Poor sample recovery was noted from 2.00m to 4.00m due to the sampling tube pushing a large cobble, during drilling. The driller confirmed, however that the speed of drilling was similar to that of BH1 and similar SPT results were returned also.

In-situ SPT Testing (carried out with a solid cone sampler) was undertaken in the more granular strata with values of N=7 at 1.00m, N=16 at 2.00m and N=23 at 3.00m.

Shear vane testing in the clayey strata returned values of 45kN/m^2 at 0.50m, 40kN/m^2 at 1.00m, 60kN/m^2 at 1.50m and 30kN/m^2 at 2.00m

The boreholes remained open and dry on completion.

3.1.1.2– Soakaway Borehole BHA

BHA was sunk to undertake a soakaway test at the north of the site. BHA encountered turf and topsoil of soft sandy gravelly clay with gravel of sandstone, pot, concrete and tarmac to 0.20m. This was underlain by natural soft to firm sandy gravelly clay to 1.00m then soft to firm slightly sandy gravelly clay to 2.00m.

Shear vane testing in the clayey strata returned values of 55kN/m^2 at 0.50m, 50kN/m^2 at 1.00m, 50kN/m^2 at 1.50m and 60kN/m^2 at 2.00m

3.1.2 Hand Excavated Trial Pits (TPA – TPD)

The four trial pits TPA – TPD were sunk mainly to expose the depth and nature of the existing foundations of the northern section of the existing building.

TPA encountered a concrete paving slab at surface of 0.05m thickness underlain by made ground of loose builders' sand to 0.10m. This was underlain by made ground of firm to stiff sandy gravelly clay with gravel of concrete and sandstone to 0.60m. Underlying this was natural medium dense clayey gravelly sand to termination at 0.70m.

TPB encountered concrete at surface of 0.05m thickness followed by made ground of firm to stiff sandy gravelly clay with gravel of sandstone and concrete to 0.50m. This was underlain by natural firm sandy gravelly clay to termination at 0.75m.

TPC encountered red decorative gravel of thickness 0.05m followed by made ground of firm very sandy gravelly clay with gravel of concrete and sandstone to 0.70m. This was underlain by natural soft to firm sandy gravelly clay to termination at 0.75m.

TPD encountered red decorative gravel of thickness 0.05m followed by topsoil of soft sandy gravelly clay to 0.40m. This was followed by made ground of soft sandy gravelly clay with gravel of sandstone to 0.85m underlain by natural soft slightly sandy gravelly clay to termination at 1.00m

Each trial pit remained stable and dry on completion, with no significant roots noted.

Trial pit sketches showing foundation depths and projection are presented in appendix A.

3.1.3 Summary of Ground Conditions Encountered

The windowless sample boreholes at the site encountered similar conditions of turf and topsoil, made ground then made ground of sandy gravelly clay then natural sandy gravelly clay to termination in each case

Trial pits beyond the varying surface conditions mostly encountered made ground of sandy gravelly clay then natural sandy gravelly clay to termination.

3.2 DCP Testing

Dynamic cone penetrometer (DCP) testing was undertaken at four (4) locations throughout the proposed access road and car parking areas. These are referenced DCP1 – DCP4. The tests were undertaken to approximately 0.90m below ground level at all locations.

Results of the DCP testing are presented in Appendix 4 together with calculations of representative CBR values for various strata that these tests encountered. Results tables are also presented below:

CBR 1

Depth (mm)	CBR Value (%)
0-150	1.5
150-490	5.7
490-560	22.5
560-690	7.6
690-840	8.3

CBR 2

Depth (mm)	CBR Value (%)
0-120	1.9
120-190	14.7
190-390	12.7
390-530	18.6
530-790	14.8

CBR 3

Depth (mm)	CBR Value (%)
0-120	1.9
120-270	3.1
270-600	3.6
600-820	5.5
820-870	20.9

Generally, it is sensible to adopt the lowest CBR value of any of the strata encountered in each test as representative of that location (as a conservative estimate). The topsoil horizon will of course be removed for road/car park construction and so it would be wise to disregard these lower results.

Based on the above a minimum CBR value of 3.6% may be achieved below a minimum depth of 0.27m. If excavation was taken to below 0.60m a higher value of 5.5% would be applicable.

3.2 Soil Plasticity and Vegetation Influence.

Geotechnical Testing has returned Plasticity Indices (PIs) of between 11.5% and 15.6% which classify the soils as Clay of Low (CL) plasticity according to BS 5930. These equate to NHBC Low Shrinkage Soils.

Although some vegetation is present at the site in the form of large hedges and smaller trees no roots were encountered in the excavations and no moisture depletion is therefore evident on the moisture profiles.

Given the above the risk to the proposed structures from vegetation related seasonal shrinkage and swelling is considered to be low.

3.3 Water Infiltration Testing.

Infiltration testing was carried out in boreholes BHA according to the BS 5930 "falling heads test in boreholes" method. The water infiltration tests were carried out with 1.00m of borehole casing remaining in situ from ground level to a depth of 1.00m, and the test response zones therefore between 1.00m and 2.00m below ground level.

Borehole BHA encountered turf and topsoil extending to a depth of 0.20m then natural sandy gravelly clay to 1.00m underlain by further sandy gravelly clay to termination at 2.00m

The testing was carried out with the entirety of the response zone in underlying natural subsoils (i.e. below the topsoil horizon and not including any made ground horizons) as these soils would be expected to be the receiving material in any subsequently excavated soakaways.

The test was deemed to have failed due to the infiltration of only 19mm over an hour, with the bulk of the initial water intake in the first 5 minutes and most of this over the initial 30 seconds.

This would suggest that although the clay contained some sand and gravel it is almost entirely impermeable. Were soakaways to be utilised at the site these would lead to waterlogging of the ground eventually.

Given the above it may be assumed that the strata at site would not provide an adequate infiltration medium for installation of soakaways and that an alternative means of disposal of surface water at the site be sought.

4 Conclusions

4.1 Foundation Design.

The windowless sample boreholes at the site encountered similar conditions of turf and topsoil, made ground then made ground of sandy gravelly clay then soft to firm and firm natural sandy gravelly clay to termination in each case.

Moisture and plasticity testing on the soils returned soils classifying as NHBC Low Shrinkage. Roots were only encountered in one of the trial pits within the topsoil, with the moisture profiles showing no vegetation moisture depletion.

Given the weak condition of the soils at the site, it is considered that foundations for the new build dwellings should comprise rafts with construction commencing from natural ground extending to a depth of 1.00m. At this depth foundations may be designed to a net bearing pressure of 50kN/m^2.

4.2 Concrete design

The results of chemical analyses of the topsoil returned Water Soluble Sulphate levels of between 29mg/l and 117mg/l (SO_4) and pH levels of 8.5. On this basis concrete in contact with the ground may be designed to ACEC Class AC-1 of BRE Special Digest 1 – Concrete in aggressive ground.

4.3 Road Design

DCP testing has indicated that the lowest CBR value for surface might be 3.1% below 120mm increasing to 3.7% below 270mm

As such, based on a CBR of 3.1%, NHBC guidance for "Shared parking and associated access areas having frequent use by commercial vehicles" recommends a sub-base of 250mm compacted stone (or 150mm with geotextile beneath) below the normal road construction (normal asphalt and base layers).

However, it should be noted that wet or winter weather and site trafficking may detrimentally affect the CBR rating of the soil once works are commenced, and CBR values may vary seasonally and with moisture content.

4.4 Soakaways

Permeability testing has confirmed that the site will not be suitable for the installation of soakaways or other means of exploiting natural drainage (such as permeable paving).

Other SuDs options could be explored, however, such as green roofs or attenuation tanks. Permeable paving is unlikely to be appropriate for the reasons given above regarding soakaways but a system of permeable paving could be adopted whereby the paving drains into a contained cell below, separated from the subsoils, with subsequent controlled outflow to mains drainage to help mitigate local flood risk during high rainfall events (essentially a shallow but wide-reaching attenuation tank fed from the permeable paving above).

END OF REPORT

The findings and contents of this (intrusive) Site Investigation Report pertain solely to the study area(s) outlined herein and are based solely on the findings of the excavations undertaken as part of the current exercise unless otherwise stated. The findings and/or recommendations of this report do not take into account any ground conditions that may be present but have hitherto not been encountered and as such further investigation and/or a reconsideration of the findings of this report should be undertaken if such conditions are subsequently encountered or an alternative development plan or land use is subsequently proposed.

This report considers various environmental and/or geological risks posed to the site and/or proposed development and offers advice accordingly as guidance only. The findings of this report will remain valid provided no change of ground or groundwater conditions, either natural or anthropogenic, take place and no warrantee is offered or implied.

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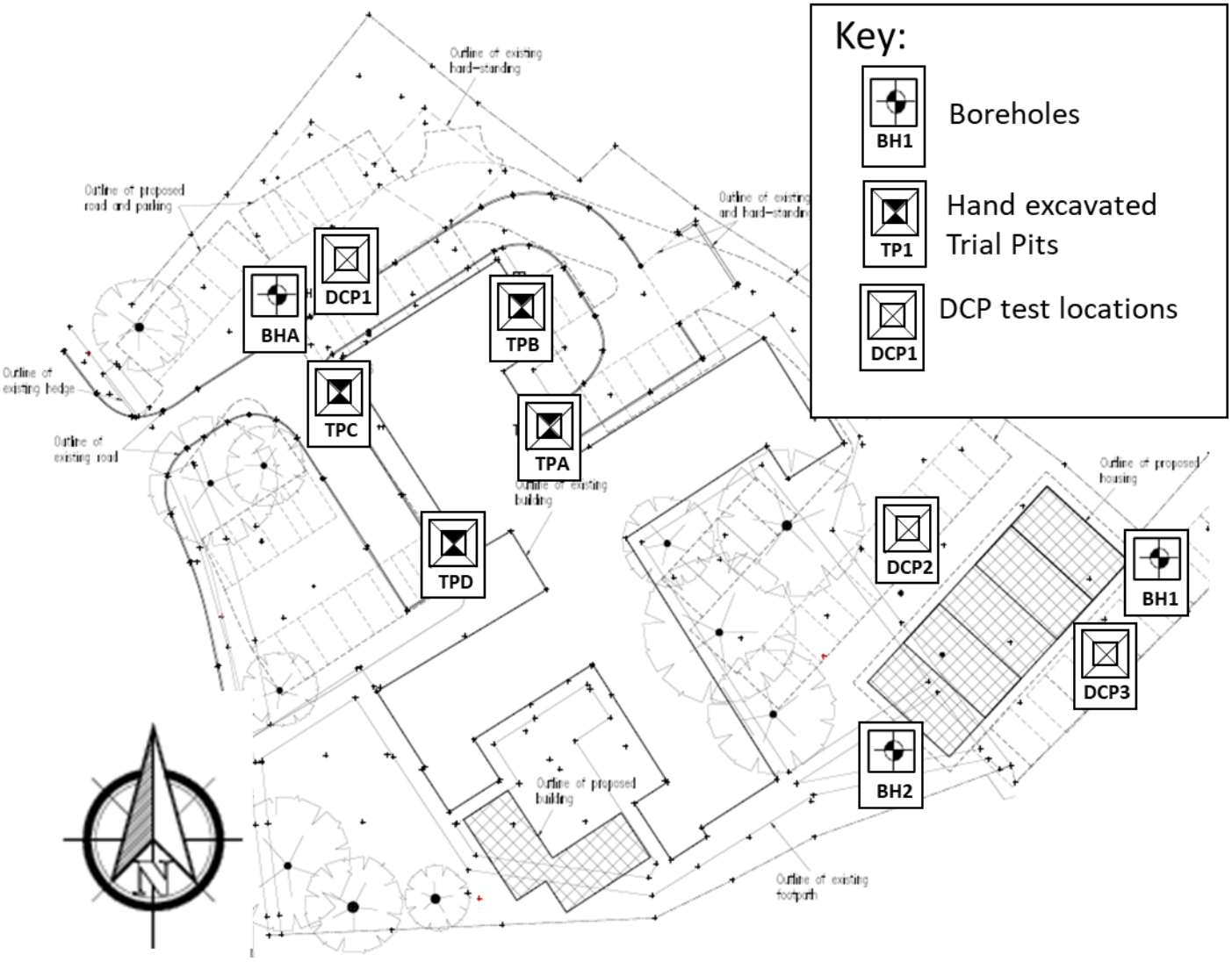
APPENDIX 1

Site Plan, Borehole & Trial Pit Logs and Diagrams

GEOINVESTIGATE Ltd.

OUR REF: G21044	YOUR REF:	SITE PLAN (NOT TO SCALE)
DATE: 31/03/21	LOCATION: Land Dentholme, Cleator Moor CA25 5PR	



GEOINVESTIGATE Ltd.

Your Ref. **Our Ref**. G21044 **BH No.1** **Sheet No. 1 of 1**

Location: Land at Dentholme, Cragg Road, Cleator Moor, CA25 5PR **DATE**: 31/03/21

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
						Cv kN/m^2			
0.20	TURF AND TOPSOIL. Soft dark brown sandy gravelly clay. Gravel is fine to coarse of sandstone and pot. Many roots noted.	200			O				0.25
		400							0.50
0.60	MADE GROUND. Soft dark reddish brown sandy gravelly clay. Gravel is fine to coarse of sandstone, mudstone and slag. Strong sulphurus odour between 0.20m and 0.40m.				O	15			0.75
							1.00m - 1.45m 1/2/2/2/2/2		
	Soft to firm reddish brown sandy gravelly CLAY. Gravel is fine to coarse of sandstone and mudstone.				O S	30	N = 8		1.00
									1.25
					O	40			1.50
									1.75
							2.00m - 2.45m 2/3/4/4/4/4		
		2600			O S		N = 16		2.00
									2.25
					O				2.50
									2.75
							3.00m - 3.45m 4/4/6/6/6/7		
					O S		N = 25		3.00
3.20									3.20
	Borehole terminated at 3.20m								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 3.20m

Borehole remained dry on completion

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

C Cone Penetration Test

BH1

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref.** G21044 **BH No.2** **Sheet No. 1 of 1**
Location: Land at Dentholme, Cragg Road, Cleator Moor, CA25 5PR **DATE**: 31/03/21

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
						Cv kN/m^2			
0.25	TURF and TOPSOIL. Soft dark brown slightly sandy gravelly clay. Gravel is fine to coarse of sandstone and tarmac. Many roots noted.	250			O				0.25
	MADE GROUND. Soft to firm dark reddish brown slightly sandy gravelly clay. Gravel is fine to coarse of sandstone and brick.	750			O	45			0.50
							1.00m - 1.45m 1/1/1/2/2/2		0.75
1.00					O S	40	N = 7		1.00
	Soft to firm reddish brown slightly sandy gravelly CLAY. Gravel is fine to coarse of sandstone, mudstone and occasional coal.								1.25
					O	60			1.50
	Becomes very gravelly from 1.60m with noted cobbles.								1.75
							2.00m - 2.45m 2/3/3/4/4/5		
	Very poor sample recovery below 2.00m. Likely soft to firm natural clay similar to strata encountered in BH1				O S	30	N = 16		2.00
									2.25
		3000			O				2.50
									2.75
							3.00m - 3.45m 4/4/5/6/6/6		
					O S		N = 23		3.00
									3.25
					O				3.50
									3.75
4.00					O				4.00
	Borehole terminated at 4.00m								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 4.00m
Borehole remained dry on completion

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH2

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref**. G21044 **BH No.A Sheet No. 1 of 1**

Location: Land at Dentholme, Cragg Road, Cleator Moor, CA25 5PR **DATE**: 31/03/21

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.20	TURF and TOPSOIL. Soft brown and dark brown sandy gravelly clay. Gravel is fine to coarse of sandstone, pot, concrete and tarmac.	200			O	Cv kN/m^2			0.25
1.00	Soft to firm reddish brown and grey slightly sandy gravelly CLAY. Gravel is fine to coarse of sandstone and mudstone.	800			O O	55 50			0.50 0.75 1.00
2.00	Soft to firm reddish brown slightly sandy gravelly CLAY. Gravel is fine to coarse of sandstone. Cobbles noted.	1000			O O	50 60			1.25 1.50 1.75 2.00
	Borehole terminated at 2.00m								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 2.00m

Key:

- Slotted Pipe
- Plain Pipe
- Bentonite
- Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test
C Cone Penetration Test

BHA

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref**. G21044 **TP No.A** **Sheet No. 1 of 1**

Location: Land at Dentholme, Cragg Road, Cleator Moor, CA25 5PR **DATE**: 06/04/21

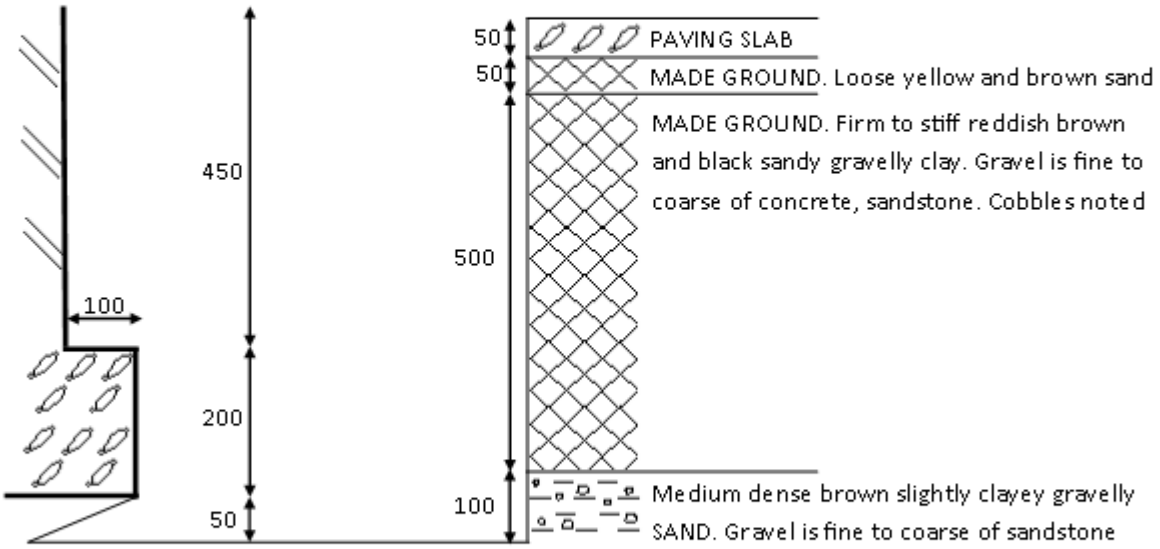
Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.05	CONCRETE PAVING SLAB	50						
0.10	MADE GROUND. Loose yellow and brown SAND.	50		O				0.25
0.60	MADE GROUND. Firm to stiff reddish brown and black sandy gravelly clay. Gravel is fine to coarse of concrete and sandstone. Cobbles noted.	500		O				0.50
0.70	Medium dense light brown slightly clayey gravelly SAND. Gravel is fine to coarse of sandstone.	100		O				0.70
	Trial pit terminated at 0.70m							

Remarks: Hand excavated to 0.70m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

OUR REF: G21044	YOUR REF:	TRIAL PIT: A
DATE: 06/04/21	LOCATION: Land at Dentholme, Cragg Road CA25 5PR	



Base of Foundation at 0.65m

Trial Pit terminated at 0.70m

Trial pit remained stable on completion

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref**. G21044 **TP No.B** **Sheet No. 1 of 1**

Location: Land at Dentholme, Cragg Road, Cleator Moor, CA25 5PR **DATE**: 06/04/21

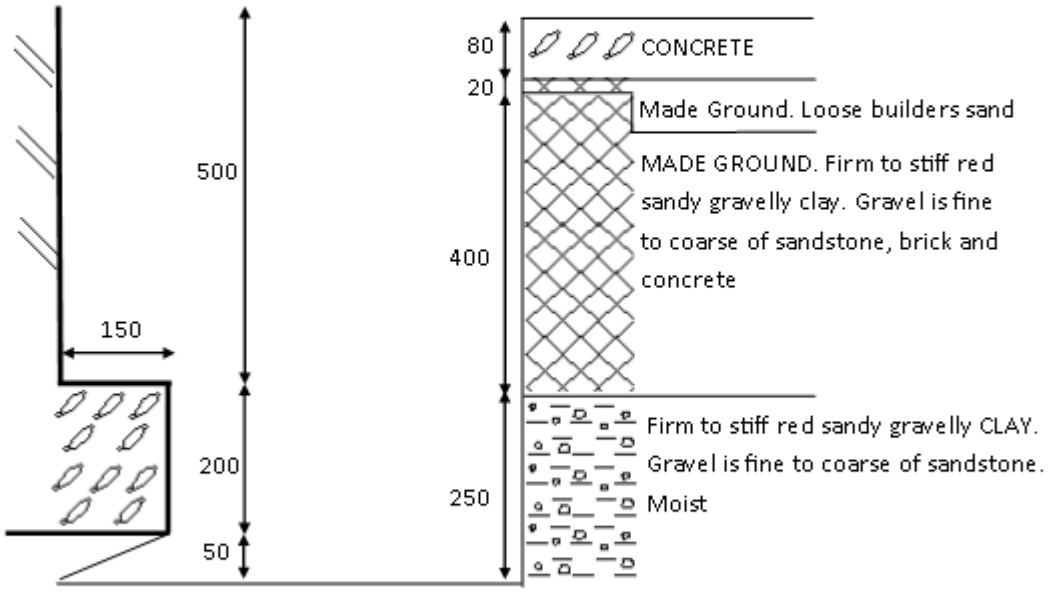
Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.08	CONCRETE.	80			Cv kN/m^2			
0.10	MADE GROUND. Loose brown builders sand.	20		O				0.25
0.50	MADE GROUND. Firm to stiff red sandy gravelly clay. Gravel is fine to coarse of sandstone and concrete.	500		O				0.50
0.75	Firm to stiff red sandy gravelly CLAY. Gravel is fine to coarse of sandstone. Moist.	250		O				0.75
	Trial pit terminated at 0.75m							

Remarks: Hand excavated to 0.75m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

OUR REF: G21044	YOUR REF:	TRIAL PIT: B
DATE: 06/04/21	LOCATION: Land at Dentholme, Cragg Road CA25 5PR	



Base of Foundation at 0.70m

Trial Pit terminated at 0.75m

Trial pit remained stable on completion

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref**. G21044 **TP No.C** **Sheet No. 1 of 1**

Location: Land at Dentholme, Cragg Road, Cleator Moor, CA25 5PR **DATE**: 06/04/21

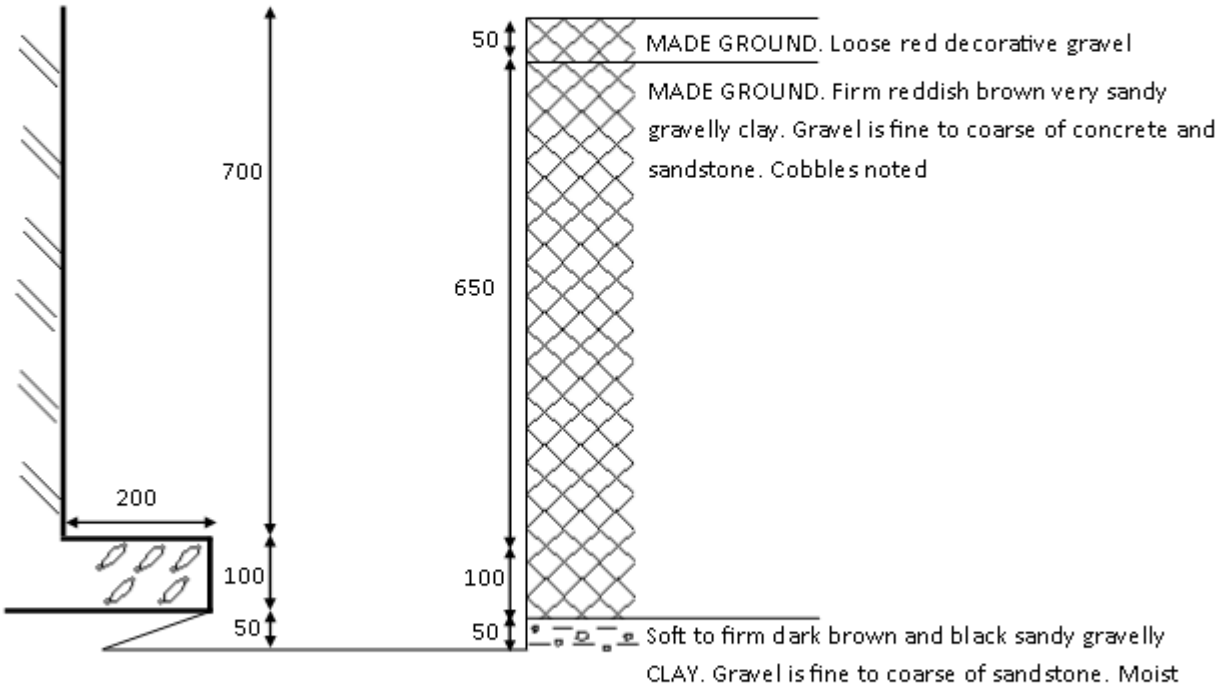
Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.05	MADE GROUND. Loose red decorative gravel.	50			Cv kN/m^2			
	MADE GROUND. Firm reddish brown very sandy gravelly clay. Gravel is fine to coarse of concrete and sandstone. Cobbles noted.	650		O				0.25
				O				0.50
0.70								
0.75	Soft to firm dark brown and black sandy gravelly CLAY. Gravel is fine to coarse of sandstone. Moist.	50		O				0.75
	Trial pit terminated at 0.75m							

Remarks: Hand excavated to 0.75m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

OUR REF: G21044	YOUR REF:	TRIAL PIT: C
DATE: 06/04/21	LOCATION: Land at Dentholme, Cragg Road CA25 5PR	



Base of Foundation at 0.80m

Trial Pit terminated at 0.85m

Trial pit remained stable on completion

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref**. G21044 **TP No.D** **Sheet No. 1 of 1**

Location: Land at Dentholme, Cragg Road, Cleator Moor, CA25 5PR **DATE**: 06/04/21

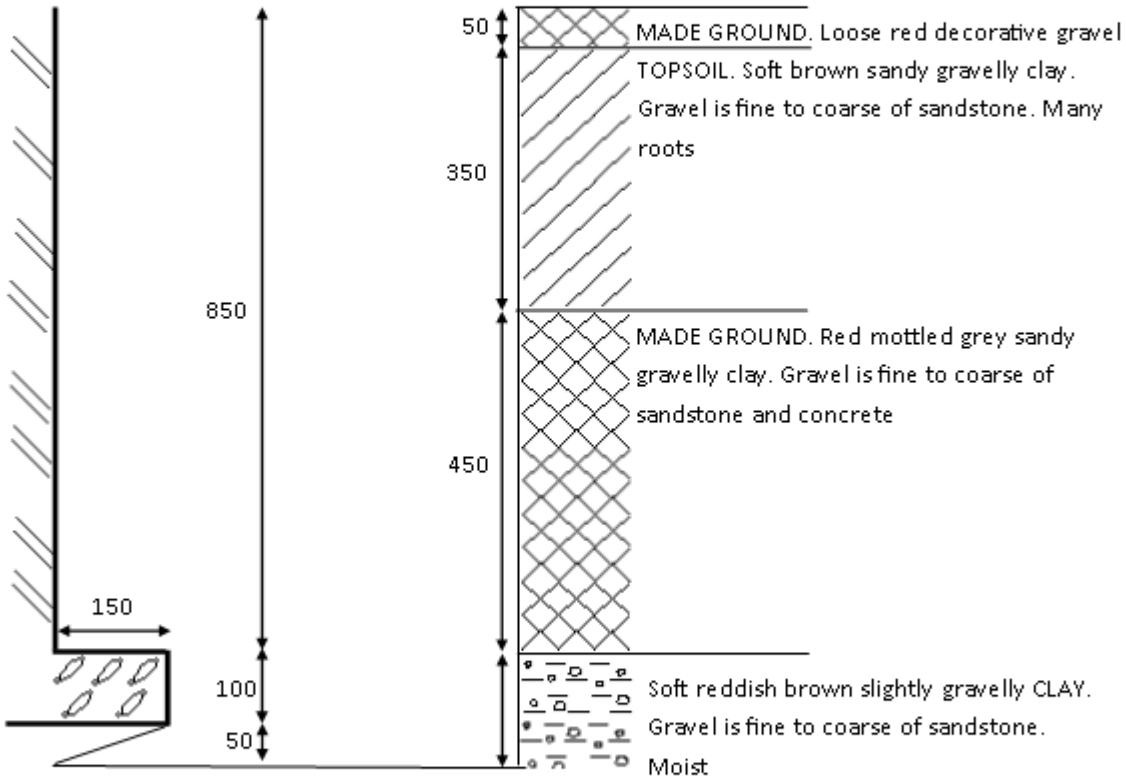
Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.05	MADE GROUND. Loose red decorative gravel.	50			Cv kN/m^2			
0.40	TOPSOIL. Soft brown sandy gravelly clay. Gravel is fine to coarse of sandstone. Many roots noted.	350		O				0.25
0.85	MADE GROUND. Soft brown mottled reddish brown sandy gravelly clay. Gravel is fine to coarse of sandstone.	450		O				0.50 0.75
1.00	Soft reddish brown slightly sandy gravelly CLAY. Gravel is fine to coarse of sandstone. Moist	150		O				1.00
	Trial pit terminated at 1.00m							

Remarks: Hand excavated to 1.00m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane

GEOINVESTIGATE Ltd.

OUR REF: G21044	YOUR REF:	TRIAL PIT: D
DATE: 06/04/21	LOCATION: Land at Dentholme, Cragg Road CA25 5PR	



Base of Foundation at 0.95m

Trial Pit terminated at 1.00m

Trial pit remained stable on completion

APPENDIX 2

Moisture content profiles and moisture & plasticity test results (Table 1)

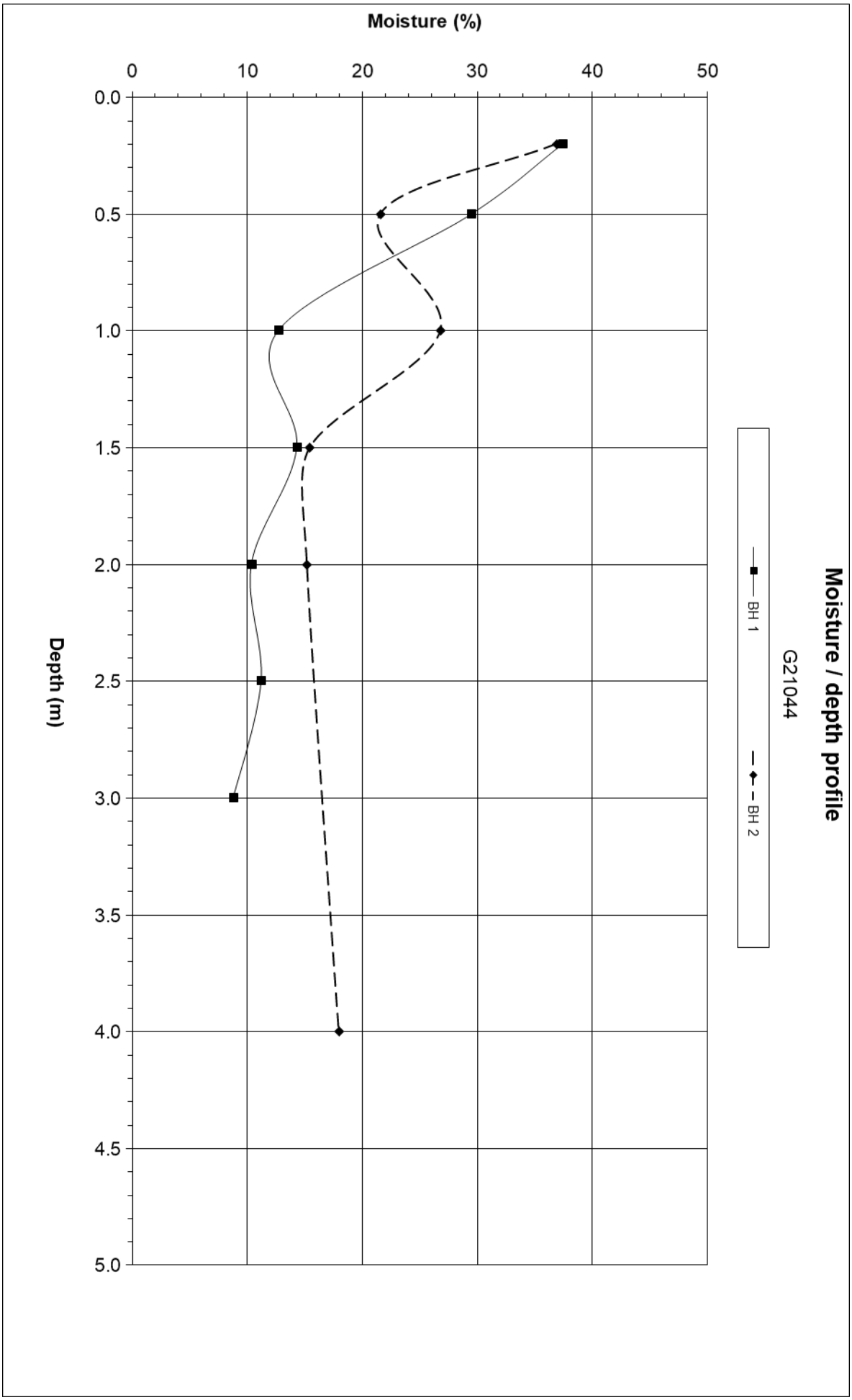
GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G21044 **Table 1**

Your ref. **Location**: Land at Dentholme, Cragg Road, Cleator Moor, CA25 5PR

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification BS5930 [1999]
1	0.20	37.4						
	0.50	29.5						
	1.00	12.7	55.7	22.8	15.9	27.4	11.5	CL
	1.50	14.3						
	2.00	10.4						
	2.50	11.2						
	3.00	8.8						
2	0.20	36.9						
	0.50	21.6						
	1.00	26.8	81.0	33.1	17.6	33.2	15.6	CL
	1.50	15.4						
	2.00	15.2						
	4.00	18.0						


Moisture (%)
0
10
20
30
40
50
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Depth (m)
BH 1
BH 2
Moisture / depth profile
G21044

APPENDIX 3

Infiltration test result

Infiltration Test Result

G21044
Land at Dentholme
Cragg Road, Cleator Moor CA25 5PR
31/03/21

Infiltration test 1

(BHA)

Time/s	Depth to water/m	Head/m (if GWL present)
0	0.000	2.000
30	0.010	1.990
60	0.011	1.989
90	0.011	1.989
120	0.011	1.989
180	0.011	1.989
240	0.012	1.988
300	0.012	1.988
600	0.014	1.986
900	0.015	1.985
1200	0.015	1.985
1800	0.017	1.983
2700	0.018	1.982
3600	0.019	1.981

Borehole dimensions:

Depth of Casing, D =	1.00	m
Diameter of Casing, D =	0.125	m
Cross-sectional area, A =	0.012277	m^2
Depth below Casing, L =	1.00	m
Ground Water Level =	N/A	m

Intake factor, F, using:

$$F = \frac{2\pi L}{\log_e\left[(L/D) + \sqrt{1 + (L/D)^2}\right]}$$

Source: BS 5930

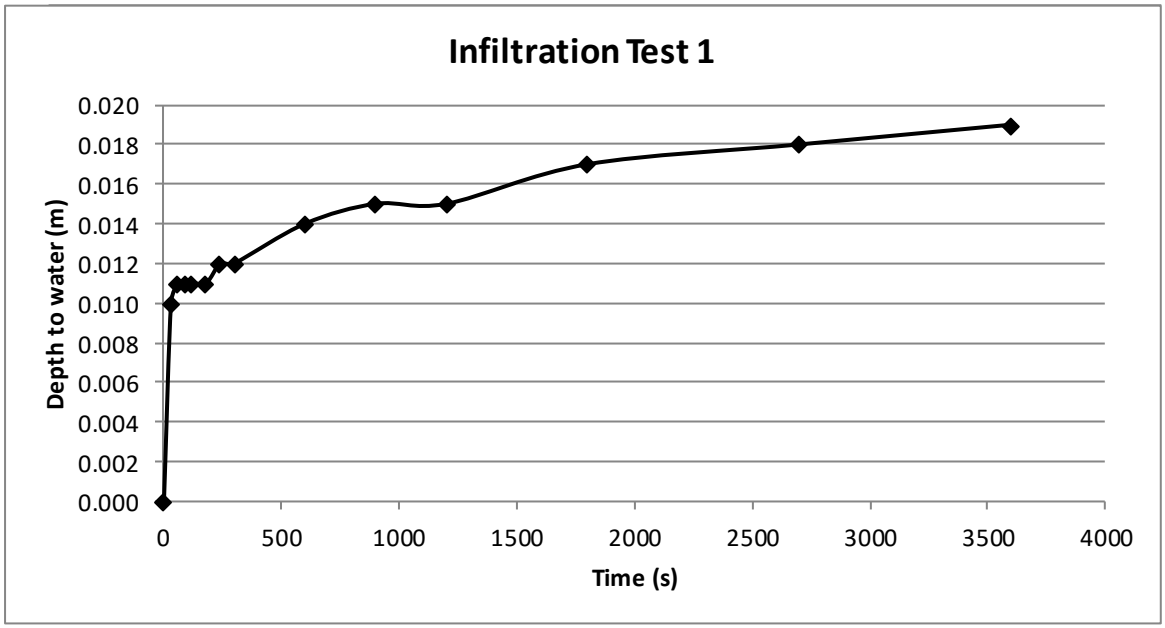
Intake factor, F =	2.264	m
Choose start time t_1 to be: t_1 =	0	s
Choose end time t_2 to be: t_2 =	3600	s
Head at time t_1, H_1 =	2.00	m
Head at time t_2, H_2 =	1.981	m

Permeability, k, using:

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2} \text{ (general approach)}$$

Source: BS 5930

Permeability, k = 1.44E-08 ms^{-1}



APPENDIX 4

Chemtech Analytical Test Report

ANALYTICAL TEST REPORT

Contract no: 95677

Contract name: Dentholme, Cragg Road, Cleator Moor, CA25 5PR

Client reference: G21086

Clients name: Geo Investigate

Clients address: Units 3a & 4 Terry Dicken Industrial Estate
Ellerbeck Way, Stokesley
North Yorkshire
TS9 7AE

Samples received: 27 April 2021

Analysis started: 27 April 2021

Analysis completed: 30 April 2021

Report issued: 30 April 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

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
95677-1	BH1	0.50	Sandy Clay with Gravel	-	-	14.0
95677-2	BH2	0.50	Sandy Clay with Gravel	-	-	15.7

Chemtech Environmental Limited

SOILS

Lab number			95677-1	95677-2
Sample id			BH1	BH2
Depth (m)			0.50	0.50
Date sampled			06/04/2021	06/04/2021
Test	**Method**	**Units**		
pH	CE004 [M]	units	8.5	8.5
Sulphate (2:1 water soluble)	CE061	mg/l SO_4	117	29

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	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)
95677-1	BH1	0.50	N	
95677-2	BH2	0.50	N	