

Abadur Chowdhury
Faithful + Gould
Email: Abadur.Chowdhury@fgould.com

Date: 8th July 2019
LKC Reference: LKC 18 1474_Slot Trenches

Dear Abadur,

RE: GROUND INVESTIGATION AT SILK STREET, NEWTON HEATH, MANCHESTER, M40 1HE.

1.0 INTRODUCTION

LK Consult Ltd (LKC) have been commissioned by Faithful + Gould to undertake a ground investigation at Silk Street, Manchester, M40 1HE. The site is located at Silk Street, Newton Heath, Manchester at approximate NGR 388180 400550.

The following work has previously been undertaken at the site:

- Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: LKC 18 1474-01, dated 20th January 2018).
- Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy, undertaken by LKC (Ref: CL-602-LKC 18 1474-02, dated 26th April 2019).

The scope of investigation was supplied by Chris Jarvis of Wilde Consulting Engineers (Wilde) and comprised the following:

- *3 trial pits to depth of 2m in the existing road to check the existing road build up strata.*
- *3 infiltration tests at locations of your choosing spread across the site.*

Figures 1 and 2 indicate the site location and boundary. Figure 3 shows the site investigation locations.

2.0 GROUND INVESTIGATION

The investigation was carried out on 3rd July 2019 and comprised the following:

- 3no. slot trenches (TP201-203) advanced to 0.8-0.9mbgl by vacuum excavation techniques. The locations of slot trenches were specified by Wilde.
- Clegg Hammer testing within slot trenches at change in strata.
- 3no. falling head tests undertaken in monitoring wells with response zones within natural strata (WS104, WS107 and WS108) installed as part of the previous geo-environmental investigation.

Investigation locations are shown on Figure 3.

- Geotechnical
- Contaminated Land
- Flood Risk and Drainage
- Asbestos
- Invasive Species
- Land Remediation
- Project Management
- Land Drilling

2.1.1 Slot trenches

The ground conditions encountered during the investigation comprised tarmac underlain by sandstone cobble sets and made ground from 0.4-0.8mbgl. Natural strata comprising slightly sandy Clay (glacial till) was encountered in all trenches up to >0.9mbgl. A summary section of the logs is provided in Plate 2-1 and profile logs are included in Appendix A.

A photographic record of trial pits is included in Appendix B.

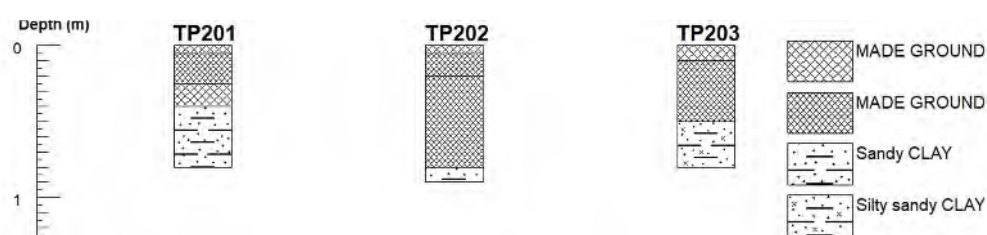


Plate 2-1: Summary of Ground Conditions.

Sandstone cobble sets were encountered in all 3no. slot trenches. The cobbles encountered varied in size, but typically ranged from approximately 0.1m to 0.15m by 0.15m to 0.25m.

Clegg hammer testing was carried in slot trenches to obtain equivalent CBR values. Testing was undertaken at each change in strata. Three tests were undertaken at each depth. A summary of the CBR testing results is included in Table 2-1:

Location	Depth	Equivalent CBR (%)
TP201	0.30m	23
	0.45m	9, 7, 9
	0.80m	4, 6, 5
TP202	0.20m	19
	0.50m	6, 4
	0.90m	7, 5, 4
TP203	0.10m	15, 9, 9
	0.45m	7, 9, 10
	0.80m	5, 5, 4

Table 2-1: Summary of Clegg Hammer Testing.

Note: Testing undertaken in triplicate at each location – results reported as ‘abort’ not included.

2.1.2 Other Considerations

Potential coal tar containing material was noted in several locations beneath tarmac and between cobbles within the slot trenches. A representative sub-sample was sprayed with PAK Marker Spray to give a qualitative indication of the presence of coal tar. If there are PAHs (Polycyclic Aromatic Hydrocarbons) present in the material there will be a yellowish/light brown discolouration showing in the white sprayed area - considered to be an indication of the presence of coal tar (see Plate 2-2, below).

If the discolouration is clear then you can assume that the examined material has more than 150ppm of PAHs (PAK spray can be used in conjunction with a UV light source). This should be considered in your waste management plan during construction.

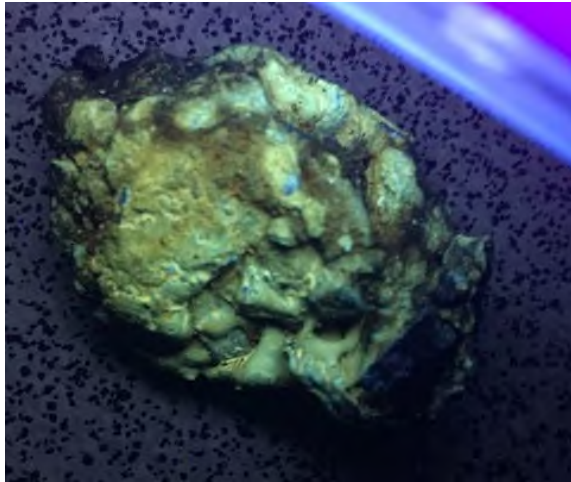


Plate 2-2: Sub-sample of tarmac sprayed with PAK marker under UV light.

2.1.3 Falling Head Tests

LKC undertook falling head tests to assess the permeability of the ground. The tests were carried out in general accordance with guidance given in BS5930 and BS 22282¹.

The tests were carried out in monitoring wells installed within the boreholes during the Phase 2 investigation. Profile logs are included in Appendix A. Locations were chosen where the response zone of the well was entirely within the natural strata and where groundwater levels would allow. Groundwater levels were measured prior to undertaking the tests. Water was added to the well to a known depth and falling water levels were measured over time.

The results are enclosed in Appendix C and summarised in Table 2-2.

BS5930² indicates that if 'Ho' is taken as the groundwater 'Head' above baseline conditions following the addition of water at the start of the permeability test and 'H' is the measured groundwater 'Head' above baseline conditions at any given time during the test then the time taken to reach a head ratio (H/H_o) of 0.37 is used to calculate the permeability of the soils.

Where slow progress was observed and H/H_o of 0.37 could not be reached in the field, the basic lag time was calculated using the available data.

¹ British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.

² BSI (1999). "Code of Practice for Site Investigations".

BH	Response Zone (mbgl) and Strata	Test No.	Initial water level (mbgl)	Basic Time Lag (where H/Ho=0.37)	Permeability (k) m/sec
WS104	2.0-4.0 (C)	1	2.36	180 mins	2.14×10^{-7}
		2		1840 mins*	2.90×10^{-8}
		3		2760 mins*	1.39×10^{-8}
WS107	1.5-5.0 (C)	1	1.71	9600 mins*	8.20×10^{-10}
WS108	1.0-4.0 (C)	1	1.32	66 mins	4.32×10^{-7}
		2		91 mins	3.12×10^{-7}
		3		1920 mins*	1.48×10^{-8}

Table 2-2: Summary of falling head tests and permeability.

Notes

*Extrapolated data where H/Ho was not reached in the field.

C=Clay.

The falling head tests carried out encountered a permeability with an order of magnitude of 10^{-7} m/sec to 10^{-10} m/sec. These results are typical of an aquiclude (based on Figure 7.3 of Sarsby³) which suggests the ground on this site is unlikely to be suitable for shallow soakaways (within superficial deposits).

3.0 SUMMARY CONCLUSION

LKC were commissioned by Faithful + Gould to undertake slot trenching within the roadways at Silk Street, Newton Heath. The scope of works was provided by Wilde Consulting engineers and comprised:

- 3 trial pits to depth of 2m in the existing road to check the existing road build up strata.
- 3 infiltration tests at locations of your choosing spread across the site.

The slot trenches encountered cobble sets of varying sizes, underlain by made ground from 0.4-0.8mbgl which in turn was underlain by natural clay strata. Potential coal tar containing material was encountered in the slot trenches.

Falling head tests undertaken in monitoring wells from the previous Phase 2 investigation reported permeabilities with an order of magnitude of 10^{-7} m/sec to 10^{-10} m/sec.

We hope the contents of this report meet your current needs.

Written by:



PETER DUNN
PRINCIPAL CONSULTANT

³ Sarsby (2005). "Environmental Geotechnics".

Enclosed:

Figures

Appendix A – Profile Logs

Appendix B – Photographic Records

Appendix C – Falling Head Tests

DISCLAIMER

The extent of the constraint discussed herein include the presence of existing services, underground structures, geotechnical conditions and ground contamination. This document has been prepared by LK Consult (LKC) who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant, experienced in preparing reports of a similar scope.

However, to the extent that the report is based or relies upon information contained in records, reports or other materials provided to LKC, which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation. Opinions on such conditions, where given, are for general guidance only. This report is prepared solely for the benefit of Faithful + Gould.

It may not be relied upon by or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full. Those using this information in subsequent assessments or evaluations do so at their own risk.

Figures

LINK

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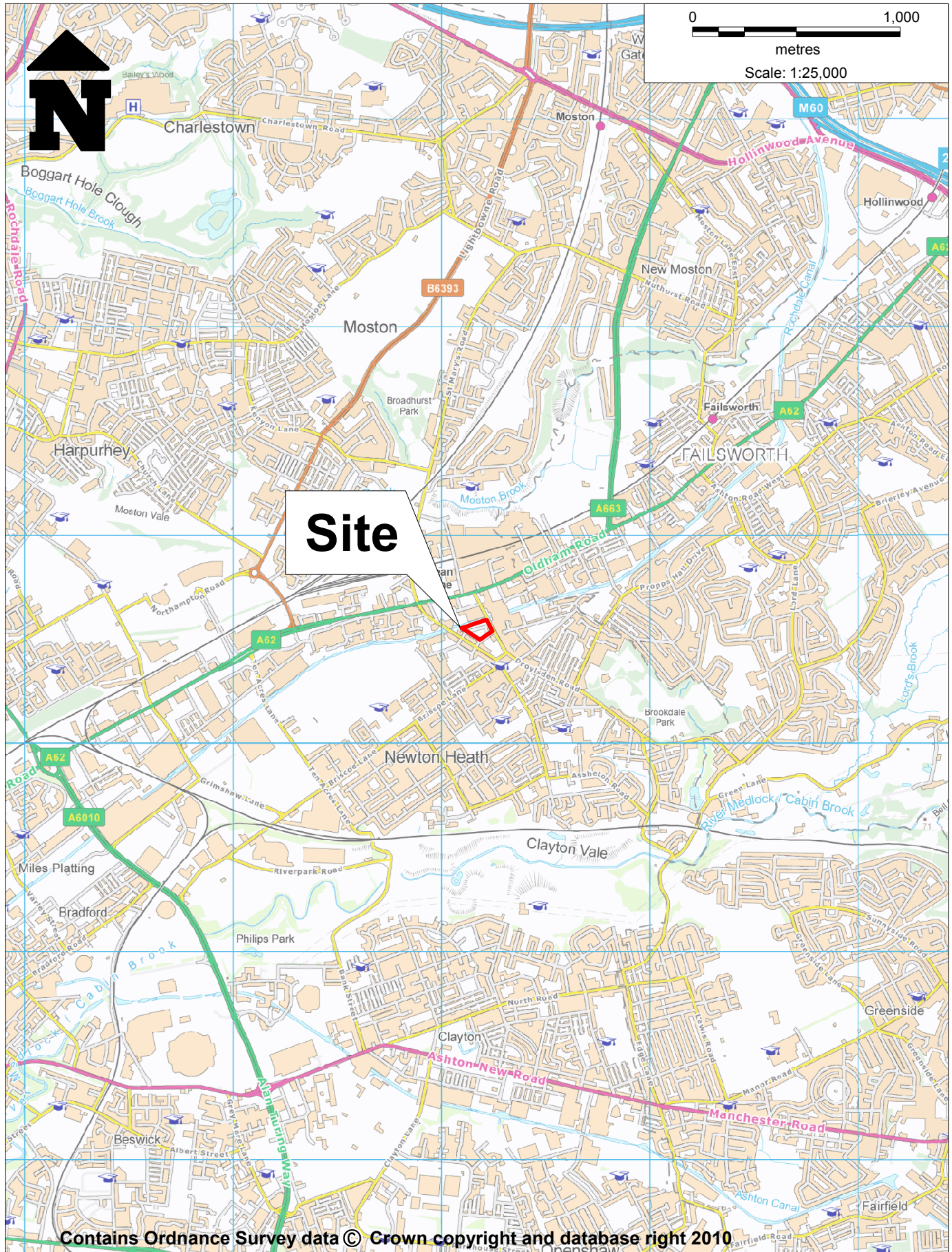
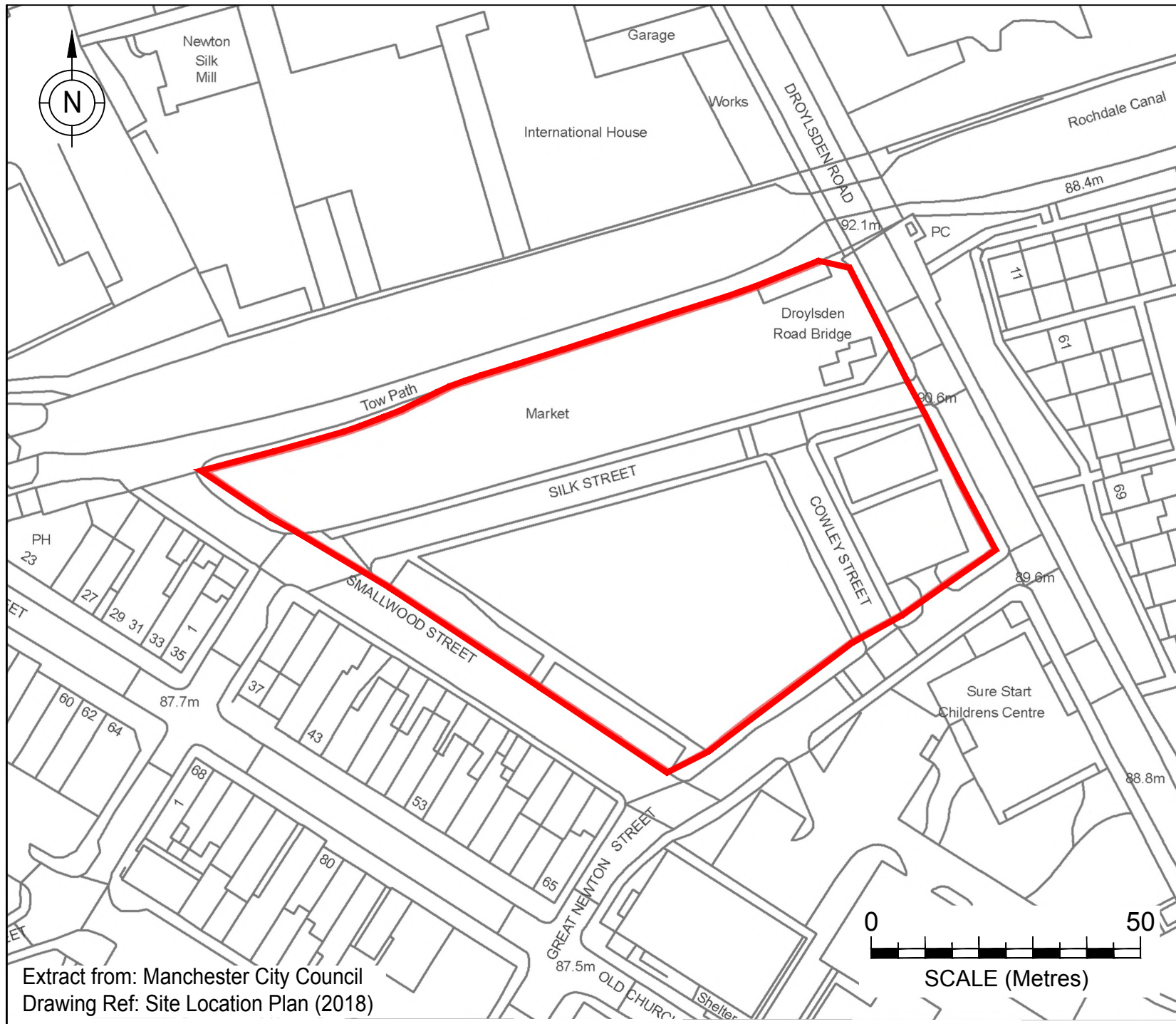


Figure 1: Site Location Plan, Land at Silk Street, Manchester

Drawn: January 2019 Scale: 1:25,000 @ A4 (see scale bar)



KEY



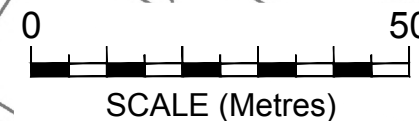
Site Boundary

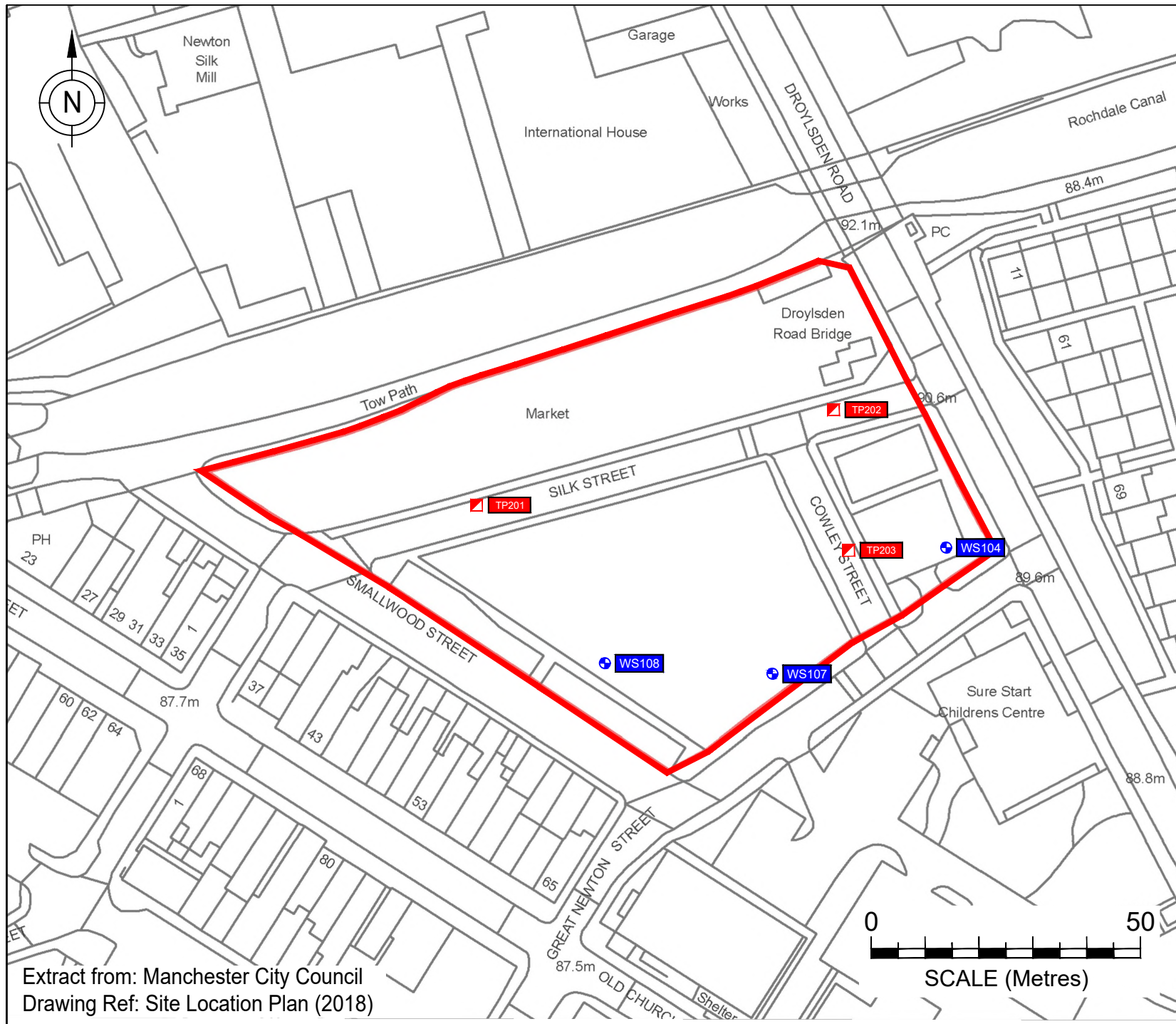
Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client: Faithful + Gould			
Site: Land at Silk Street, Manchester			
Title: Site Boundary Plan			
Job No.: LK 18 1474	Scale (See Scale Bar): 1:1000 @ A4	Figure: 2	Revision:
Drawn By: AC	Checked By: PD	Drawn: Jan 2019	

Extract from: Manchester City Council
Drawing Ref: Site Location Plan (2018)





KEY

-  Site Boundary
-  Trial Pit (TP)
-  Window Sample Borehole (WS)
Falling Head Tests Within
Phase 2 Investigation Boreholes

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client:		Faithful + Gould			
Site:		Land at Silk Street, Manchester			
Title:		Site Investigation Location Plan			
Job No.:	LKC 18 1474	Scale (See Scale Bar):	1:1000 @ A4	Figure:	Revision:
Drawn By:	AC	Checked By:	PD	Drawn:	Jul 2019
				3	

Appendix A – Profile Logs



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LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com					Site Land at Silk Street			Trial Pit Number TP203	
Excavation Method Vacuum Excavated Trial Pit to 0.80mbgl.		Dimensions 0.8 x 0.4m		Ground Level (mOD) 89.00		Client Faithful and Gould		Job Number LKC 18 1474	
		Location (Handheld GPS) 388222 E 400539 N		Dates 03/07/2019		Project Contractor LK Consult		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
			CBR value at 0.10mbgl = 15%, 9%, 9% CBR value at 0.45mbgl = 7%, 9%, 10% CBR value at 0.80mbgl = 5%, 5%, 4%	88.90 88.50 88.20	(0.10) 0.10 (0.40) 0.50 (0.30) 0.80	MADE GROUND: Sandstone cobble sets. Cobbles between 0.05-0.10m in width. MADE GROUND: brown sandy GRAVEL with occasional ash and brick fragments. Sand is fine to coarse. Gravel is fine to medium and angular to subangular comprising sandstone and limestone. Brown sandy CLAY. Sand is fine to medium. Complete at 0.80m			
						Remarks Location accurate to 3.00-5.00m. Trial pit dry and stable. Elevation and coordinates from gps and topographic plan.			
Scale (approx) 1:20						Logged By BR		Figure No. LKC 18 1474.TP203	

 LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com						Site Land at Silk Street		Number WS104	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD) 91.00		Client Faithful and Gould		Job Number LKC 18 1474	
		Location (Handheld GPS) 388239 E 400536 N		Dates 20/02/2019- 21/02/2019		Project Contractor LK Consult		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.30	D1 PID = 0.1ppm			90.95	0.05	MADE GROUND: Tarmacadam.			
1.20-1.65	SPT N=17		3,4/5,4,4,4		(1.65)	MADE GROUND: Light brown/grey very sandy GRAVEL with abundant ash and clinker and frequent brick and occasional coal. Sand is fine to medium. Gravel is fine to medium and angular to subrounded comprising limestone and mudstone. Slate fragments at 1.50mbgl.			
1.70-2.00	D2 PID < 0.1ppm			89.30	1.70	Stiff consistency brown mottled grey sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to medium and rounded to subrounded comprising mudstone. Rootlets at 1.70mbgl. Less mottling below 2.00mbgl. Wet strata at 2.10mbgl.			
2.00-2.45	SPT N=17		2,3/3,4,5,5						
2.50-3.00	B3 PID < 0.1ppm								
3.00-3.45	SPT N=35		4,5/7,7,10,11		(2.73)				
4.00-4.43	SPT 50/280		8,8/11,12,13,14						
				86.57	4.43	STP refusal at 4.43mbgl on very stiff clay. Complete at 4.43m			
Remarks GPS coordinates accurate to 6m. Elevation estimated from www.freemaptools.com/elevation-finder.							Scale (approx) 1:40	Logged By BR	Figure No. LKC 18 1474.WS104

Excavation Method

Drive-in Windowless Sampler

Dimensions
Ground Level (mOD)

91.00

Client

Faithful and Gould

Job
Number
LKC 18 1474

Location (Handheld GPS)

388203 E 400517 N

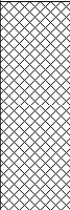
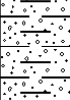
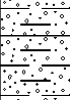
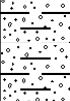
Dates

20/02/2019-
21/02/2019

Project Contractor

LK Consult

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.40	D1 PID < 0.1ppm					MADE GROUND: Dark brown/black sandy GRAVEL with abundant brick and frequent ash. Sand is fine to coarse. Gravel is fine to coarse and angular to subangular comprising limestone, mudstone and sandstone. Cobble at 0.2mbgl.			
1.20-1.65	SPT N=11		1,2/2,3,3,3	89.90	1.10	Firm consistency orangey brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to medium and rounded to subrounded comprising mudstone. Very stiff clay below 3.00mbgl.			
1.50-1.70	D2 PID < 0.1ppm				(1.10)				
2.00-2.45	SPT N=12		1,2/2,3,3,4	88.80	2.20	Stiff consistency brown mottled grey slightly gravelly sandy CLAY with occasional sands pockets. Sand is fine to medium. Gravel is fine to medium and subrounded comprising quartz and mudstone.			
2.50-3.00	B3 PID < 0.1ppm								
3.00-3.45	SPT N=28		4,4/6,6,7,9						
4.00-4.45	SPT N=25		5,5/5,6,6,8		(3.25)				
5.00-5.45	SPT N=23		4,4/5,5,6,7	85.55	5.45	Complete at 5.45m			

Remarks

GPS coordinates accurate to 6m.
Elevation estimated from www.freemaptools.com/elevation-finder.

Scale
(approx)

1:40

Logged
By

BR

Figure No.

LKC 18 1474.WS107

Excavation Method

Drive-in Windowless Sampler

Dimensions
Ground Level (mOD)

91.00

Client

Faithful and Gould

Job
Number
LKC 18 1474

Location (Handheld GPS)

388164 E 400528 N

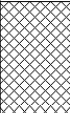
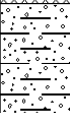
Dates

20/02/2019-
21/02/2019

Project Contractor

LK Consult

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.30	D1 PID = 0.2ppm					MADE GROUND: Brown very sandy clayey GRAVEL with abundant brick and frequent concrete fragments. Sand is fine to medium. Gravel is fine to medium and angular to subangular comprising sandstone.			
				90.40	0.60	Stiff consistency light brown mottled grey gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to medium and angular to subrounded comprising sandstone. Less mottling below 2.40mbgl. Very stiff clay below 2.00mbgl.			
1.20-1.65	SPT N=11		1,1/2,2,3,4						
1.20-1.50	D2 PID < 0.1ppm								
1.50-1.80	B2 PID < 0.1ppm								
2.00-2.45	SPT N=22		2,3/4,6,6,6						
2.50-3.00	B3 PID < 0.1ppm				(3.85)				
3.00-3.45	SPT N=28		5,5/6,6,8,8						
3.50-4.00	B4 PID < 0.1ppm								
4.00-4.45	SPT 50/295		5,6/12,12,13,13						
				86.55	4.45	SPT refusal at 4.45mbgl on very stiff CLAY. Complete at 4.45m			

Remarks

Elevation estimated from www.freemaptools.com/elevation-finder.
GPS coordinates accurate to 6m.

Scale
(approx)

1:40

Logged
By

BR

Figure No.

LKC 18 1474.WS108

Appendix B – Photographic Records



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Slot Trench TP201



Slot Trench TP202



Slot Trench TP203



Appendix C – Falling Head Tests



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LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkggroup.com			Site Land at Silk Street	Borehole Number WS104
In Situ Permeability Type Falling Head	Test No. 1	Ground Level (mOD) 91.00	Client Faithful and Gould	Job Number LKC 18 1474
	Location 388239 E 400536 N	Dates 20/02/2019- 21/02/2019	Project Contractor BR	Sheet 1/7

Height of casing above ground level:	0.00 m
Depth to Base of Borehole:	4.00 m bgl
Depth to Base of Casing:	2.00 m bgl
Depth to equilibrium water level:	2.36 m bgl
Test Length L:	2.00 m
Diameter of Test Length D:	0.10 m
Area of Test Section:	0.0079 m ²
Intake Factor F:	3.4060
(after condition D, figure 6, BS 5930)	

PERMEABILITY (after Hvorslev, 1951)

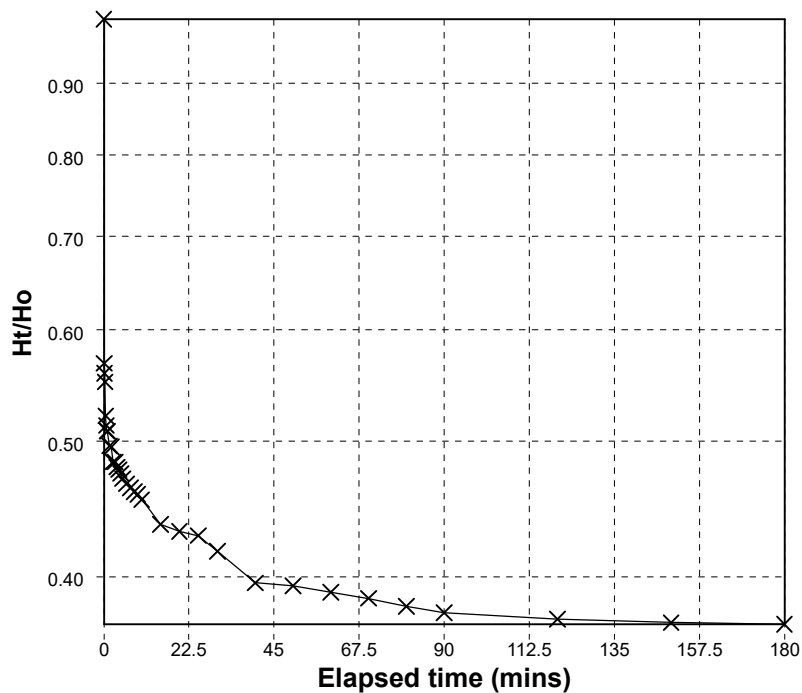
Basic Time Lag Analysis

The value T when $H_t/H_o = 0.37$ is the basic time lag, T

T = 180.00

k = 2.14E-07 ms⁻¹

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.00	0.000	2.360	1.000
0.08	1.020	1.340	0.568
0.17	1.040	1.320	0.559
0.33	1.060	1.300	0.551
0.50	1.130	1.230	0.521
0.67	1.150	1.210	0.513
0.83	1.160	1.200	0.508
1.00	1.160	1.200	0.508
1.50	1.190	1.170	0.496
2.00	1.192	1.168	0.495
2.50	1.220	1.140	0.483
3.00	1.221	1.139	0.483
3.50	1.229	1.131	0.479
4.00	1.235	1.125	0.477
4.50	1.242	1.118	0.474
5.00	1.250	1.110	0.470
6.00	1.260	1.100	0.466
7.00	1.268	1.092	0.463
8.00	1.275	1.085	0.460
9.00	1.280	1.080	0.458
10.00	1.289	1.071	0.454
15.00	1.331	1.029	0.436
20.00	1.342	1.018	0.431
25.00	1.350	1.010	0.428
30.00	1.376	0.984	0.417
40.00	1.425	0.935	0.396
50.00	1.431	0.929	0.394
60.00	1.440	0.920	0.390
70.00	1.449	0.911	0.386
80.00	1.460	0.900	0.381
90.00	1.471	0.889	0.377
120.00	1.480	0.880	0.373
150.00	1.485	0.875	0.371
180.00	1.487	0.873	0.370



Remarks

Key: bgl = Below Ground Level btoc = Below Top of Casing

In Situ Permeability Type

Falling Head

Test No.

2

Ground Level (mOD)

91.00

Client

Faithful and Gould

**Job
Number**

LKC 18 1474

Location

388239 E 400536 N

Dates

20/02/2019-
21/02/2019

Project Contractor

BR

Sheet

2/7

Height of casing above ground level:	0.00 m
Depth to Base of Borehole:	4.00 m bgl
Depth to Base of Casing:	2.00 m bgl
Depth to equilibrium water level:	2.36 m bgl
Test Length L:	2.00 m
Diameter of Test Length D:	0.10 m
Area of Test Section:	0.0079 m ²
Intake Factor F:	3.4060
(after condition D, figure 6, BS 5930)	

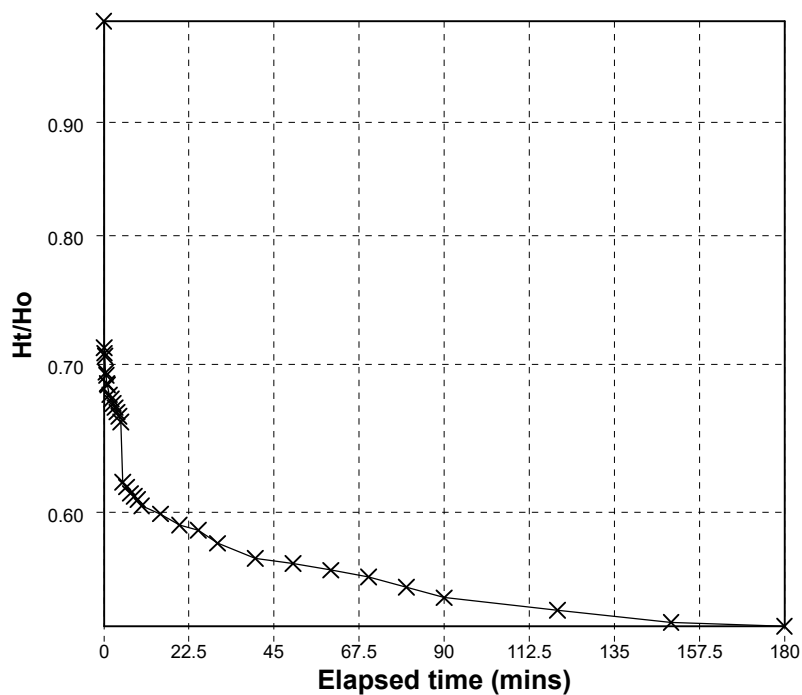
PERMEABILITY (after Hvorslev, 1951)
Basic Time Lag Analysis

The value T when $H_t/H_o = 0.37$ is the basic time lag, T

T = 1839.77

k = 2.09E-08 ms⁻¹

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.00	0.000	2.360	1.000
0.08	0.680	1.680	0.712
0.17	0.690	1.670	0.708
0.33	0.695	1.665	0.706
0.50	0.721	1.639	0.694
0.67	0.728	1.632	0.692
0.83	0.740	1.620	0.686
1.00	0.744	1.616	0.685
1.50	0.760	1.600	0.678
2.00	0.768	1.592	0.675
2.50	0.774	1.586	0.672
3.00	0.782	1.578	0.669
3.50	0.788	1.572	0.666
4.00	0.795	1.565	0.663
4.50	0.805	1.555	0.659
5.00	0.900	1.460	0.619
6.00	0.907	1.453	0.616
7.00	0.916	1.444	0.612
8.00	0.921	1.439	0.610
9.00	0.925	1.435	0.608
10.00	0.935	1.425	0.604
15.00	0.947	1.413	0.599
20.00	0.962	1.398	0.592
25.00	0.970	1.390	0.589
30.00	0.990	1.370	0.581
40.00	1.010	1.350	0.572
50.00	1.017	1.343	0.569
60.00	1.026	1.334	0.565
70.00	1.037	1.323	0.561
80.00	1.050	1.310	0.555
90.00	1.064	1.296	0.549
120.00	1.081	1.279	0.542
150.00	1.098	1.262	0.535
180.00	1.101	1.259	0.533


Remarks
Key: bgl = Below Ground Level btoc = Below Top of Casing

In Situ Permeability Type

Falling Head

Test No.

3

Ground Level (mOD)

91.00

Client

Faithful and Gould

**Job
Number**

LKC 18 1474

Location

388239 E 400536 N

Dates

20/02/2019-
21/02/2019

Project Contractor

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Height of casing above ground level:	0.00 m
Depth to Base of Borehole:	4.00 m bgl
Depth to Base of Casing:	2.00 m bgl
Depth to equilibrium water level:	2.36 m bgl
Test Length L:	2.00 m
Diameter of Test Length D:	0.10 m
Area of Test Section:	0.0079 m ²
Intake Factor F:	3.4060
(after condition D, figure 6, BS 5930)	

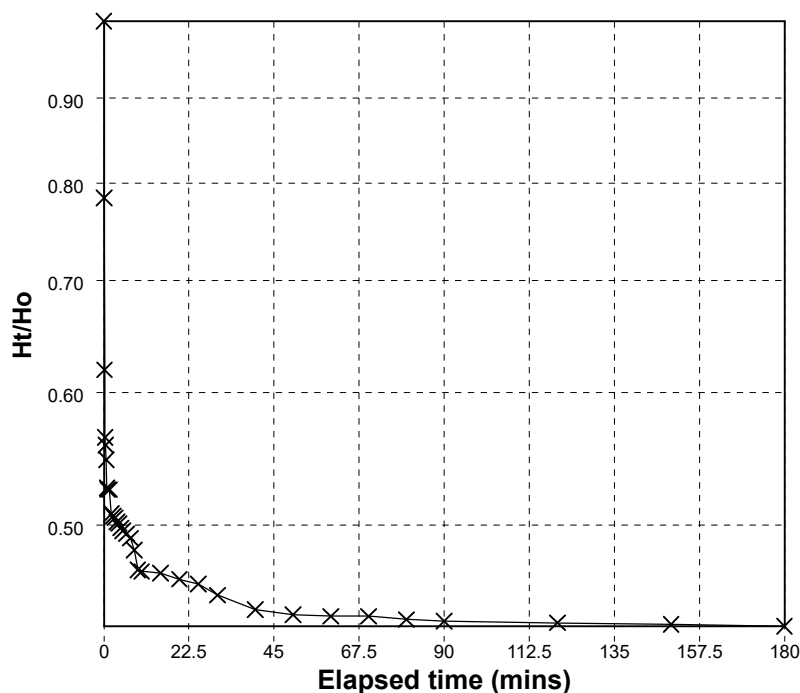
PERMEABILITY (after Hvorslev, 1951)
Basic Time Lag Analysis

The value T when $H_t/H_o = 0.37$ is the basic time lag, T

T = 2762.16

k = 1.39E-08 ms⁻¹

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.00	0.000	2.360	1.000
0.08	0.510	1.850	0.784
0.17	0.900	1.460	0.619
0.33	1.030	1.330	0.564
0.50	1.042	1.318	0.558
0.67	1.070	1.290	0.547
0.83	1.118	1.242	0.526
1.00	1.120	1.240	0.525
1.50	1.122	1.238	0.525
2.00	1.162	1.198	0.508
2.50	1.167	1.193	0.506
3.00	1.169	1.191	0.505
3.50	1.175	1.185	0.502
4.00	1.177	1.183	0.501
4.50	1.185	1.175	0.498
5.00	1.189	1.171	0.496
6.00	1.195	1.165	0.494
7.00	1.201	1.159	0.491
8.00	1.220	1.140	0.483
9.00	1.250	1.110	0.470
10.00	1.252	1.108	0.469
15.00	1.255	1.105	0.468
20.00	1.264	1.096	0.464
25.00	1.272	1.088	0.461
30.00	1.288	1.072	0.454
40.00	1.310	1.050	0.445
50.00	1.317	1.043	0.442
60.00	1.319	1.041	0.441
70.00	1.320	1.040	0.441
80.00	1.324	1.036	0.439
90.00	1.326	1.034	0.438
120.00	1.329	1.031	0.437
150.00	1.331	1.029	0.436
180.00	1.333	1.027	0.435


Remarks
Key: bgl = Below Ground Level btoc = Below Top of Casing

In Situ Permeability Type

Falling Head

Test No.

1

Ground Level (mOD)

91.00

Client

Faithful and Gould

**Job
Number**

LKC 18 1474

Location

388203 E 400517 N

Dates

20/02/2019-
21/02/2019

Project Contractor

BR

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Height of casing above ground level:	0.00 m
Depth to Base of Borehole:	4.71 m bgl
Depth to Base of Casing:	1.50 m bgl
Depth to equilibrium water level:	1.71 m bgl
Test Length L:	3.21 m
Diameter of Test Length D:	0.05 m
Area of Test Section:	0.0020 m ²
Intake Factor F:	4.1541
(after condition D, figure 6, BS 5930)	

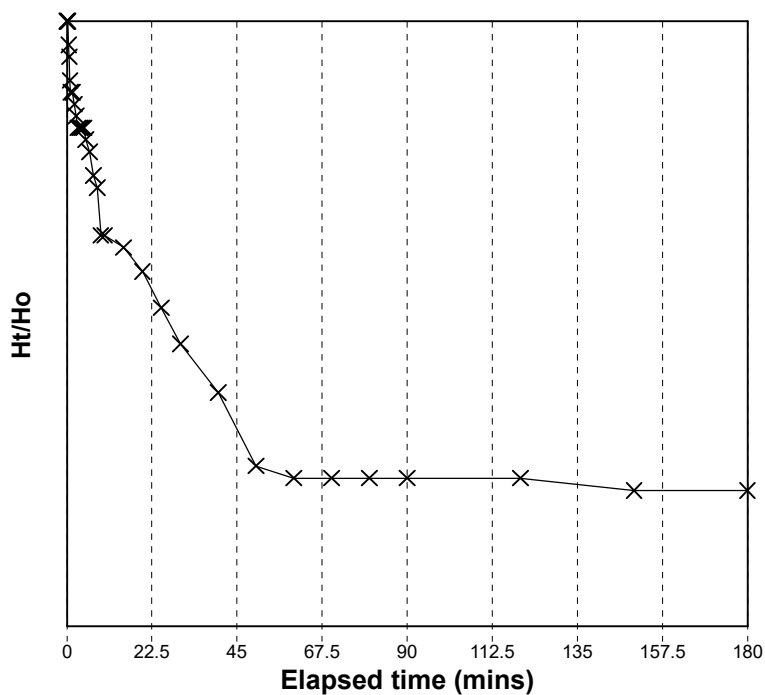
PERMEABILITY (after Hvorslev, 1951)
Basic Time Lag Analysis

The value T when $H_t/H_o = 0.37$ is the basic time lag, T

T = 9601.23

k = 8.20E-10 ms⁻¹

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.00	0.121	1.589	1.000
0.08	0.121	1.589	1.000
0.17	0.121	1.589	1.000
0.33	0.121	1.589	1.000
0.50	0.124	1.586	0.998
0.67	0.126	1.584	0.997
0.83	0.129	1.581	0.995
1.00	0.130	1.580	0.994
1.50	0.130	1.580	0.994
2.00	0.132	1.578	0.993
2.50	0.134	1.576	0.992
3.00	0.135	1.575	0.991
3.50	0.136	1.574	0.991
4.00	0.136	1.574	0.991
4.50	0.136	1.574	0.991
5.00	0.137	1.573	0.990
6.00	0.139	1.571	0.989
7.00	0.142	1.568	0.987
8.00	0.143	1.567	0.986
9.00	0.149	1.561	0.982
10.00	0.150	1.560	0.982
15.00	0.151	1.559	0.981
20.00	0.155	1.555	0.979
25.00	0.159	1.551	0.976
30.00	0.164	1.546	0.973
40.00	0.171	1.539	0.969
50.00	0.180	1.530	0.963
60.00	0.181	1.529	0.962
70.00	0.182	1.528	0.962
80.00	0.182	1.528	0.962
90.00	0.182	1.528	0.962
120.00	0.182	1.528	0.962
150.00	0.183	1.527	0.961
180.00	0.183	1.527	0.961


Remarks
Key: bgl = Below Ground Level btoc = Below Top of Casing

In Situ Permeability Type

Falling Head

Test No.

1

Ground Level (mOD)

91.00

Client

Faithful and Gould

**Job
Number**

LKC 18 1474

Location

388164 E 400528 N

Dates

20/02/2019-
21/02/2019

Project Contractor

BR

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Height of casing above ground level:	0.00 m
Depth to Base of Borehole:	4.00 m bgl
Depth to Base of Casing:	1.00 m bgl
Depth to equilibrium water level:	1.32 m bgl
Test Length L:	3.00 m
Diameter of Test Length D:	0.10 m
Area of Test Section:	0.0079 m ²
Intake Factor F:	4.6035
(after condition D, figure 6, BS 5930)	

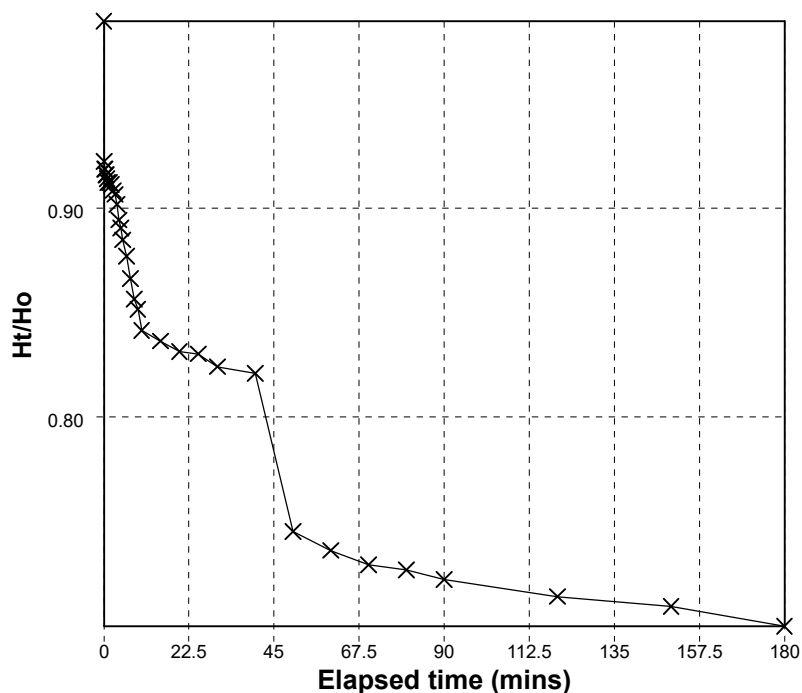
PERMEABILITY (after Hvorslev, 1951)
Basic Time Lag Analysis

The value T when $H_t/H_o = 0.37$ is the basic time lag, T

T = 65.79

k = 4.32E-07 ms⁻¹

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.00	0.000	1.320	1.000
0.08	0.100	1.220	0.924
0.17	0.105	1.215	0.920
0.33	0.105	1.215	0.920
0.50	0.109	1.211	0.917
0.67	0.110	1.210	0.917
0.83	0.112	1.208	0.915
1.00	0.115	1.205	0.913
1.50	0.115	1.205	0.913
2.00	0.116	1.204	0.912
2.50	0.120	1.200	0.909
3.00	0.123	1.197	0.907
3.50	0.130	1.190	0.902
4.00	0.140	1.180	0.894
4.50	0.145	1.175	0.890
5.00	0.153	1.167	0.884
6.00	0.164	1.156	0.876
7.00	0.178	1.142	0.865
8.00	0.192	1.128	0.855
9.00	0.198	1.122	0.850
10.00	0.211	1.109	0.840
15.00	0.218	1.102	0.835
20.00	0.224	1.096	0.830
25.00	0.226	1.094	0.829
30.00	0.233	1.087	0.823
40.00	0.238	1.082	0.820
50.00	0.330	0.990	0.750
60.00	0.341	0.979	0.742
70.00	0.348	0.972	0.736
80.00	0.351	0.969	0.734
90.00	0.356	0.964	0.730
120.00	0.366	0.954	0.723
150.00	0.371	0.949	0.719
180.00	0.382	0.938	0.711


Remarks
Key: bgl = Below Ground Level btoc = Below Top of Casing

In Situ Permeability Type

Falling Head

Test No.

2

Ground Level (mOD)

91.00

Client

Faithful and Gould

**Job
Number**

LKC 18 1474

Location

388164 E 400528 N

Dates

20/02/2019-
21/02/2019

Project Contractor

BR

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Height of casing above ground level:	0.00 m
Depth to Base of Borehole:	4.00 m bgl
Depth to Base of Casing:	1.00 m bgl
Depth to equilibrium water level:	1.32 m bgl
Test Length L:	3.00 m
Diameter of Test Length D:	0.10 m
Area of Test Section:	0.0079 m ²
Intake Factor F:	4.6035
(after condition D, figure 6, BS 5930)	

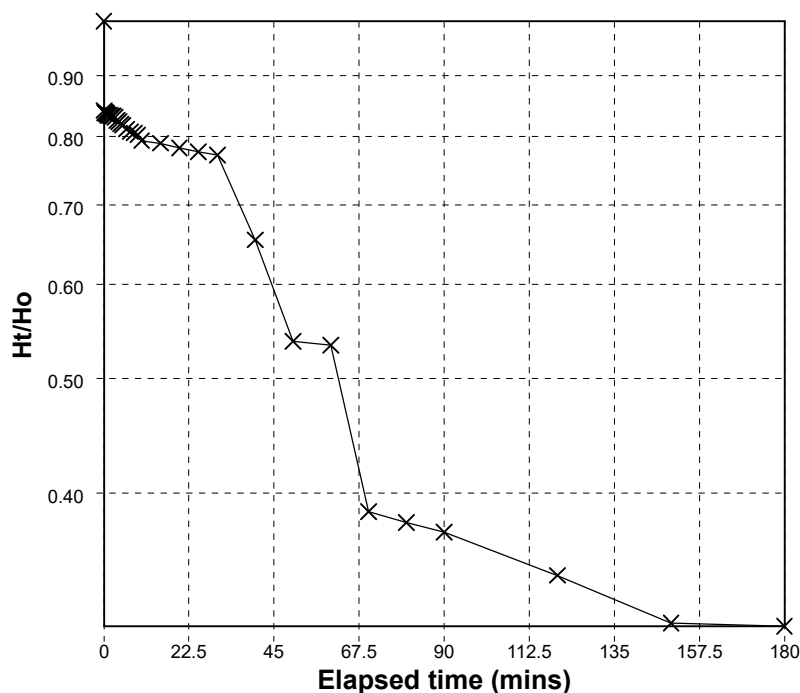
PERMEABILITY (after Hvorslev, 1951)
Basic Time Lag Analysis

The value T when $H_t/H_o = 0.37$ is the basic time lag, T

T = 91.00

k = 3.12E-07 ms⁻¹

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.00	0.000	1.320	1.000
0.08	0.210	1.110	0.841
0.17	0.215	1.105	0.837
0.33	0.215	1.105	0.837
0.50	0.215	1.105	0.837
0.67	0.216	1.104	0.836
0.83	0.218	1.102	0.835
1.00	0.220	1.100	0.833
1.50	0.221	1.099	0.833
2.00	0.222	1.098	0.832
2.50	0.222	1.098	0.832
3.00	0.224	1.096	0.830
3.50	0.231	1.089	0.825
4.00	0.233	1.087	0.823
4.50	0.239	1.081	0.819
5.00	0.242	1.078	0.817
6.00	0.250	1.070	0.811
7.00	0.255	1.065	0.807
8.00	0.257	1.063	0.805
9.00	0.261	1.059	0.802
10.00	0.273	1.047	0.793
15.00	0.279	1.041	0.789
20.00	0.288	1.032	0.782
25.00	0.296	1.024	0.776
30.00	0.302	1.018	0.771
40.00	0.457	0.863	0.654
50.00	0.611	0.709	0.537
60.00	0.617	0.703	0.533
70.00	0.810	0.510	0.386
80.00	0.821	0.499	0.378
90.00	0.830	0.490	0.371
120.00	0.870	0.450	0.341
150.00	0.910	0.410	0.311
180.00	0.912	0.408	0.309


Remarks
Key: bgl = Below Ground Level btoc = Below Top of Casing

In Situ Permeability Type

Falling Head

Test No.

3

Ground Level (mOD)

91.00

Client

Faithful and Gould

**Job
Number**

LKC 18 1474

Location

388164 E 400528 N

Dates

20/02/2019-
21/02/2019

Project Contractor

BR

Sheet

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Height of casing above ground level:	0.00 m
Depth to Base of Borehole:	4.00 m bgl
Depth to Base of Casing:	1.00 m bgl
Depth to equilibrium water level:	1.32 m bgl
Test Length L:	3.00 m
Diameter of Test Length D:	0.10 m
Area of Test Section:	0.0079 m ²
Intake Factor F:	4.6035
(after condition D, figure 6, BS 5930)	

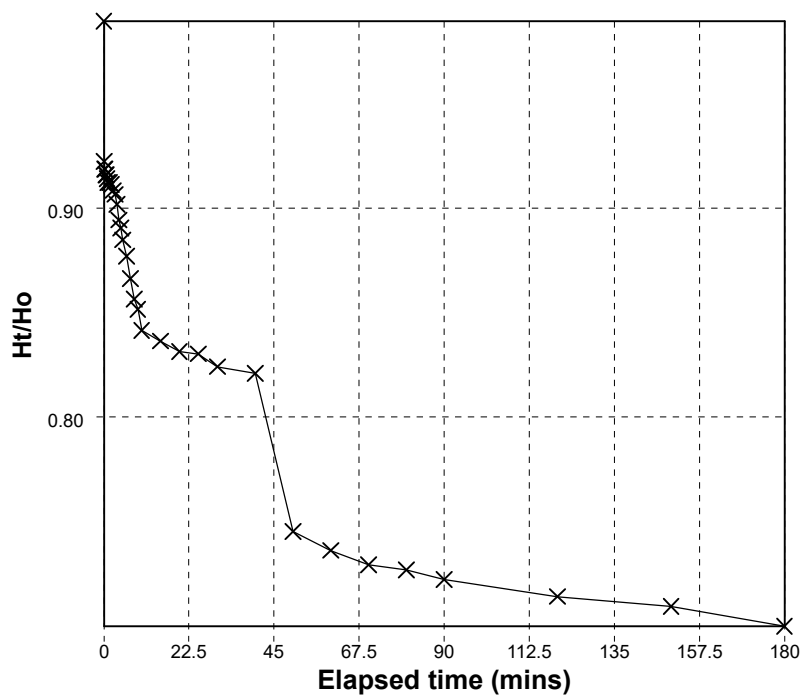
PERMEABILITY (after Hvorslev, 1951)
Basic Time Lag Analysis

The value T when $H_t/H_o = 0.37$ is the basic time lag, T

T = 1919.85

k = 1.48E-08 ms⁻¹

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.00	0.000	1.320	1.000
0.08	0.100	1.220	0.924
0.17	0.105	1.215	0.920
0.33	0.105	1.215	0.920
0.50	0.109	1.211	0.917
0.67	0.110	1.210	0.917
0.83	0.112	1.208	0.915
1.00	0.115	1.205	0.913
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4.00	0.140	1.180	0.894
4.50	0.145	1.175	0.890
5.00	0.153	1.167	0.884
6.00	0.164	1.156	0.876
7.00	0.178	1.142	0.865
8.00	0.192	1.128	0.855
9.00	0.198	1.122	0.850
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25.00	0.226	1.094	0.829
30.00	0.233	1.087	0.823
40.00	0.238	1.082	0.820
50.00	0.330	0.990	0.750
60.00	0.341	0.979	0.742
70.00	0.348	0.972	0.736
80.00	0.351	0.969	0.734
90.00	0.356	0.964	0.730
120.00	0.366	0.954	0.723
150.00	0.371	0.949	0.719
180.00	0.382	0.938	0.711


Remarks
Key: bgl = Below Ground Level btoc = Below Top of Casing

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- » Asbestos
- » Invasive Species
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- » Land Drilling