

Ref: J20-043-R02

Date: 9th November 2020

FAO: Stuart Mackley

Elberry Properties Ltd
12 Northgate
Chichester
West Sussex
PO19 1BA

Dear Stuart,

Re: Infiltration Testing – The Steddles, Yapton

GCC was commissioned by Elberry Properties Ltd in October 2020 to undertake additional infiltration testing to support the proposed residential development at the above site.

Reference to the British Geological Survey (BGS) Map extracts and previous investigations indicate the site to overlie superficial River Terrace Deposits (undifferentiated - sand, silt and clay) over bedrock geology of the Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (undifferentiated).

A total of 3no. trial-pits (SA201-SA203) were excavated on the 4th November 2020 at the site (locations shown on Figure 1) with the subsequent infiltration testing carried out in the pits between the 4th and 6th of November. The ground conditions encountered in the trial-pits are shown on the attached calculation sheets.

Infiltration testing was conducted in accordance with the procedures detailed in BRE DG365 and comprised piping water into an open trial hole, the drop in measured head over time was then recorded to give an indication of soakage potential. BRE DG365, 2016 states that for an accurate infiltration rate to be obtained, a soakage pit needs to be filled three times in quick succession. Each test is completed once 75% of the water present has drained away.

The infiltration calculation sheets are appended and the rates are summarised below.

Location	Stratum	Trial Pit Base Depth	Infiltration Rate (m/sec)	Notes
SA201 Test 1	Silt	0.6m	3.95×10^{-6}	Final data point extrapolated. Indicative only
SA201 Test 2		0.6m	9.02×10^{-6}	Test complete
SA201 Test 3		0.6m	8.92×10^{-6}	Test complete



Location	Stratum	Trial Pit Base Depth	Infiltration Rate (m/sec)	Notes
SA202 Test 1	Silty Clay	0.6m	6.75×10^{-6}	Test complete
SA202 Test 2	Silty Clay	0.6m	1.44×10^{-5}	Test complete
SA202 Test 3	Silty Clay	0.6m	1.07×10^{-5}	Test complete

Location	Stratum	Trial Pit Base Depth	Infiltration Rate (m/sec)	Notes
SA203 Test 1	Silty Clay	0.6m	4.14×10^{-6}	Final data point extrapolated. Indicative only
SA203 Test 2	Silty Clay	0.6m	2.97×10^{-6}	Final data point extrapolated. Indicative only
SA203 Test 3	Silty Clay	0.6m	5.73×10^{-6}	Test complete

Yours sincerely

ANTONY PLATT
Director
For Ground Condition Consultants Ltd

RASMUS PALMGREN
Director
For Ground Condition Consultants Ltd

Encl: Figure 1: Location plan
Infiltration Test Results



Ground Condition Consultants Ltd
10 Waldegrave Close Southampton SO19 9RY

client
ELBERRY

project
THE STEDDLES, YAPTON

title
INVESTIGATION LOCATION PLAN

scale NTS drawn by AP checked by RP

date 09 NOV 2020 cad file J20-043

drawing number
FIGURE 1

rev.
0

Soakaway Calculations

Soakaway Test No. SA201 - Test 1
Contract: Yapton
Contract No. J20-043

Field Test

Depth of Pit 0.60 m
Width of Pit 0.50 m
Length of Pit 1.00 m
Depth of Pit Soaked 0.40 m

ap50 1.1 m2
Vp75-25 0.1 m3
t75-25 383.9 min
water used 0.2000 m3
f 3.946E-06 m/sec.

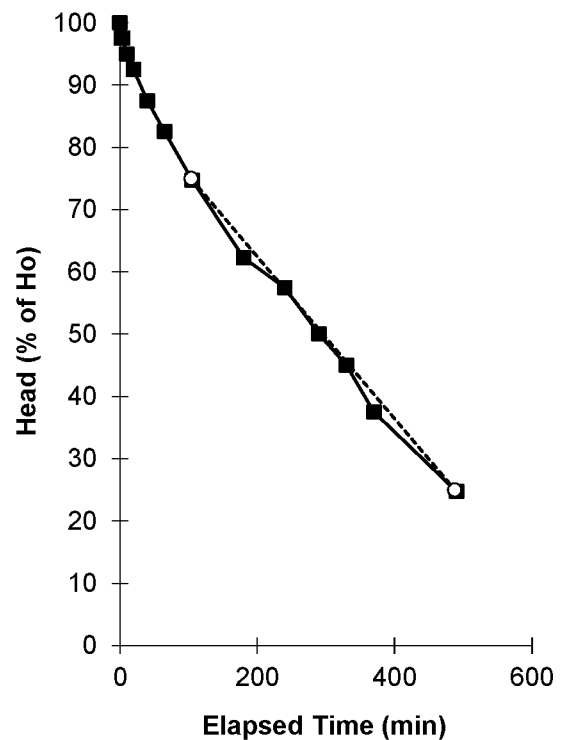
Trial Pit Log (include details of groundwater):

0.0-0.2 - Grass over brown soft silty CLAY (TS)
0.2-0.4 - Light brown very gravelly CLAY with occasional red brick frag (MG)
0.4-0.6 - Light brown slightly gravelly chalk SILT.
Gravel is fine to medium angular to subangular chalk and fine to coarse angular to rounded flint.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.20	0	100	0.40
0.21	2	98	0.39
0.21	4	98	0.39
0.22	10	95	0.38
0.23	20	93	0.37
0.25	40	88	0.35
0.27	65	83	0.33
0.30	105	75	0.30
0.35	180	62	0.25
0.37	240	58	0.23
0.40	290	50	0.20
0.42	330	45	0.18
0.45	370	38	0.15
0.50	490	25	0.10

T75 103.710 75
T25 487.647 25
T75-25 383.937 Derived from Best Fit



Comments

Final data point extrapolated. Infiltration rate should be considered indicative only.

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10 Waldegrave Close
Southampton, SO19 9RY

Soakaway Calculations

Soakaway Test No. SA201 - Test 2
Contract: Yapton
Contract No. J20-043

Field Test

Depth of Pit 0.60 m
Width of Pit 0.50 m
Length of Pit 1.00 m
Depth of Pit Soaked 0.40 m

ap50 1.1 m2
Vp75-25 0.1 m3
t75-25 167.9 min
water used 0.2000 m3
f 9.023E-06 m/sec.

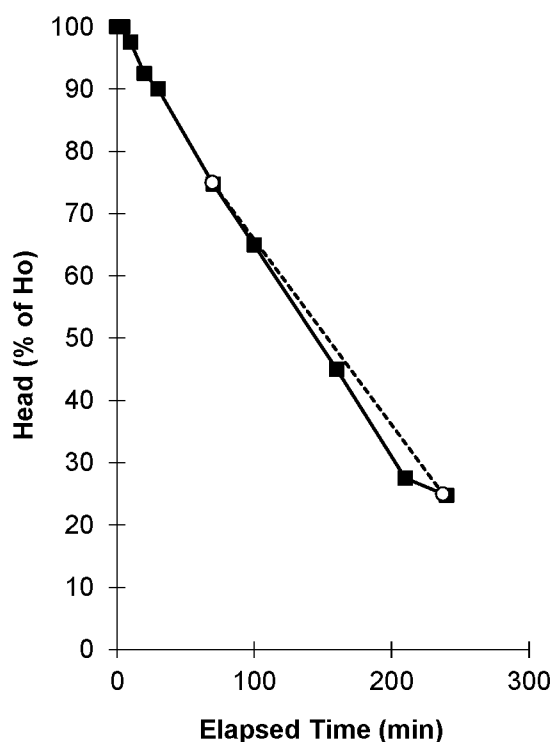
Trial Pit Log (include details of groundwater):

0.0-0.2 - Grass over brown soft silty CLAY (TS)
0.2-0.4 - Light brown very gravelly CLAY with occasional red brick frag (MG)
0.4-0.6 - Light brown slightly gravelly chalk SILT.
Gravel is fine to medium angular to subangular chalk and fine to coarse angular to rounded flint.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.20	0	100	0.40
0.20	2	100	0.40
0.20	4	100	0.40
0.21	10	98	0.39
0.23	20	93	0.37
0.24	30	90	0.36
0.30	70	75	0.30
0.34	100	65	0.26
0.42	160	45	0.18
0.49	210	28	0.11
0.50	240	25	0.10

T75 69.344 75
T25 237.273 25
T75-25 167.928 Derived from Best Fit



Comments

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10 Waldegrave Close
Southampton, SO19 9RY

Soakaway Calculations

Soakaway Test No. SA201 - Test 3
Contract: Yapton
Contract No. J20-043

Field Test

Depth of Pit 0.60 m
Width of Pit 0.50 m
Length of Pit 1.00 m
Depth of Pit Soaked 0.40 m

ap50 1.1 m2
Vp75-25 0.1 m3
t75-25 169.9 min
water used 0.2000 m3
f 8.916E-06 m/sec.

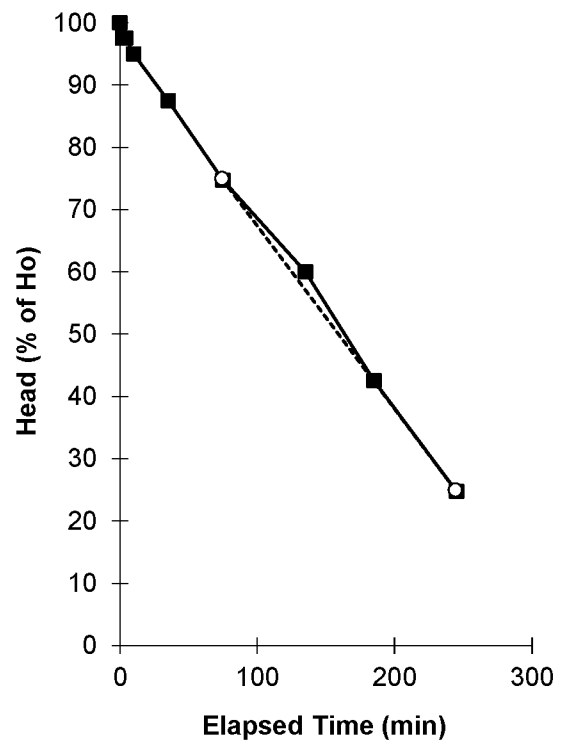
Trial Pit Log (include details of groundwater):

0.0-0.2 - Grass over brown soft silty CLAY (TS)
0.2-0.4 - Light brown very gravelly CLAY with occasional red brick frag (MG)
0.4-0.6 - Light brown slightly gravelly chalk SILT.
Gravel is fine to medium angular to subangular chalk and fine to coarse angular to rounded flint.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.20	0	100	0.40
0.21	2	98	0.39
0.21	4	98	0.39
0.22	10	95	0.38
0.25	35	88	0.35
0.30	75	75	0.30
0.36	135	60	0.24
0.43	185	43	0.17
0.50	245	25	0.10

T75 74.216 75
T25 244.155 25
T75-25 169.939 Derived from Best Fit



Comments

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10 Waldegrave Close
Southampton, SO19 9RY

Soakaway Calculations

Soakaway Test No. SA202 - Test 1
 Contract: Yapton
 Contract No. J20-043

Field Test

Depth of Pit 0.60 m
 Width of Pit 0.50 m
 Length of Pit 1.00 m
 Depth of Pit Soaked 0.40 m

ap50 1.1 m²
 Vp75-25 0.1 m³
 t75-25 224.4 min
 water used 0.2000 m³
 f 6.752E-06 m/sec.

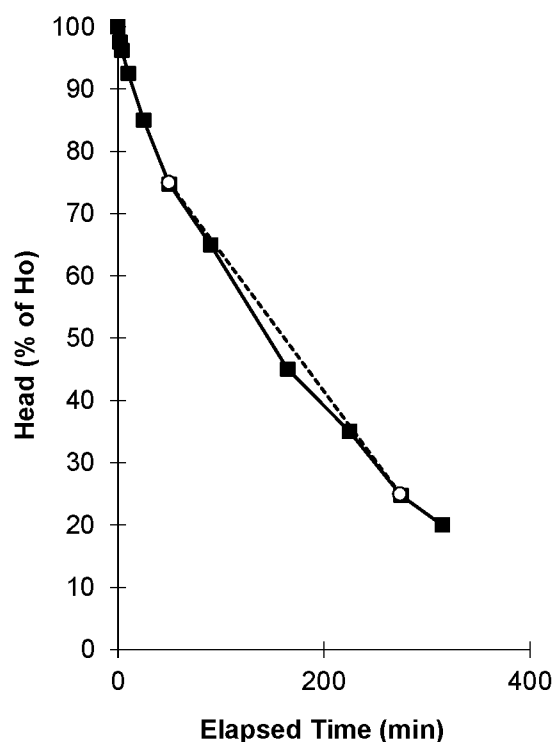
Trial Pit Log (include details of groundwater):

0.0-0.3 - Grass over brown soft silty CLAY (TS)
 0.3-0.6 - Brown silty CLAY.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.20	0	100	0.40
0.21	2	98	0.39
0.22	4	96	0.39
0.23	10	93	0.37
0.26	25	85	0.34
0.30	50	75	0.30
0.34	90	65	0.26
0.42	165	45	0.18
0.46	225	35	0.14
0.50	275	25	0.10
0.52	315	20	0.08

T75 49.390 75
 T25 273.780 25
 T75-25 224.390 Derived from Best Fit



Comments

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10 Waldegrave Close
 Southampton, SO19 9RY

Soakaway Calculations

Soakaway Test No. SA202 - Test 2
Contract: Yapton
Contract No. J20-043

Field Test

Depth of Pit 0.60 m
Width of Pit 0.50 m
Length of Pit 1.00 m
Depth of Pit Soaked 0.40 m

ap50 1.1 m2
Vp75-25 0.1 m3
t75-25 105.3 min
water used 0.2000 m3
f 1.439E-05 m/sec.

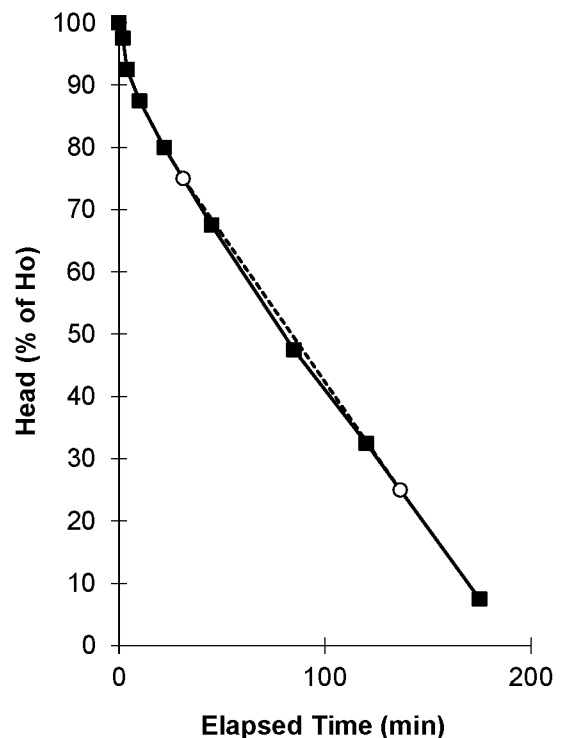
Trial Pit Log (include details of groundwater):

0.0-0.3 - Grass over brown soft silty CLAY (TS)
0.3-0.6 - Brown silty CLAY.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.20	0	100	0.40
0.21	2	98	0.39
0.23	4	93	0.37
0.25	10	88	0.35
0.28	22	80	0.32
0.33	45	68	0.27
0.41	85	48	0.19
0.47	120	33	0.13
0.57	175	8	0.03

T75 31.200 75
T25 136.500 25
T75-25 105.300 Derived from Best Fit



Comments

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10 Waldegrave Close
Southampton, SO19 9RY

Soakaway Calculations

Soakaway Test No. SA202 - Test 3
Contract: Yapton
Contract No. J20-043

Field Test

Depth of Pit 0.60 m
Width of Pit 0.50 m
Length of Pit 1.00 m
Depth of Pit Soaked 0.41 m

ap50 1.115 m²
Vp75-25 0.1025 m³
t75-25 143.0 min
water used 0.2050 m³
f 1.071E-05 m/sec.

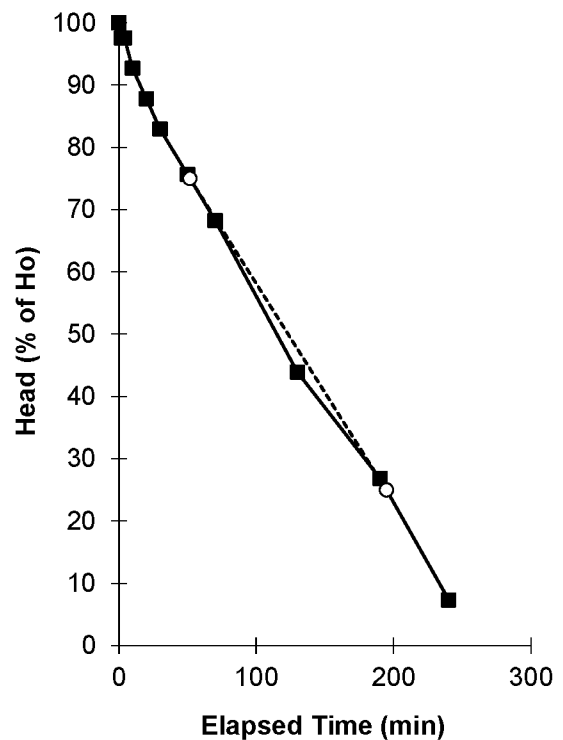
Trial Pit Log (include details of groundwater):

0.0-0.3 - Grass over brown soft silty CLAY (TS)
0.3-0.6 - Brown silty CLAY.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.19	0	100	0.41
0.20	2	98	0.40
0.20	4	98	0.40
0.22	10	93	0.38
0.24	20	88	0.36
0.26	30	83	0.34
0.29	50	76	0.31
0.32	70	68	0.28
0.42	130	44	0.18
0.49	190	27	0.11
0.57	240	7	0.03

T75 51.667 75
T25 194.688 25
T75-25 143.021 Derived from Best Fit



Comments

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10 Waldegrave Close
Southampton, SO19 9RY

Soakaway Calculations

Soakaway Test No. SA203 - Test 1
Contract: Yapton
Contract No. J20-043

Field Test

Depth of Pit 0.60 m
Width of Pit 0.50 m
Length of Pit 1.00 m
Depth of Pit Soaked 0.40 m

ap50 1.1 m2
Vp75-25 0.1 m3
t75-25 365.9 min
water used 0.2000 m3
f 4.141E-06 m/sec.

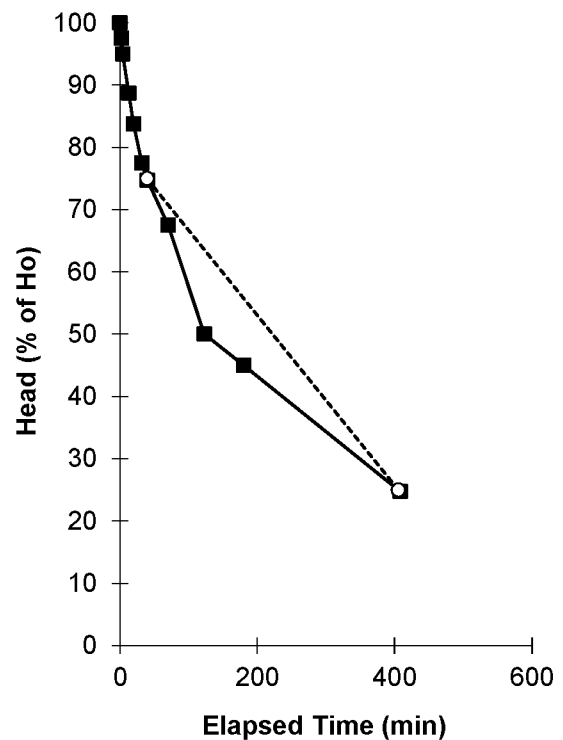
Trial Pit Log (include details of groundwater):

0.0-0.3 - Grass over brown soft silty CLAY (TS)
0.3-0.6 - Brown silty CLAY.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.20	0	100	0.40
0.21	2	98	0.39
0.22	4	95	0.38
0.25	13	89	0.36
0.27	20	84	0.34
0.29	32	78	0.31
0.30	40	75	0.30
0.33	70	68	0.27
0.40	123	50	0.20
0.42	180	45	0.18
0.50	408	25	0.10

T75 39.273 75
T25 405.185 25
T75-25 365.912 Derived from Best Fit



Comments

Final data point extrapolated. Infiltration rate should be considered indicative only.

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10 Waldegrave Close
Southampton, SO19 9RY

Soakaway Calculations

Soakaway Test No. SA203 - Test 2
Contract: Yapton
Contract No. J20-043

Field Test

Depth of Pit 0.60 m
Width of Pit 0.50 m
Length of Pit 1.00 m
Depth of Pit Soaked 0.40 m

ap50 1.1 m2
Vp75-25 0.1 m3
t75-25 509.6 min
water used 0.2000 m3
f 2.973E-06 m/sec.

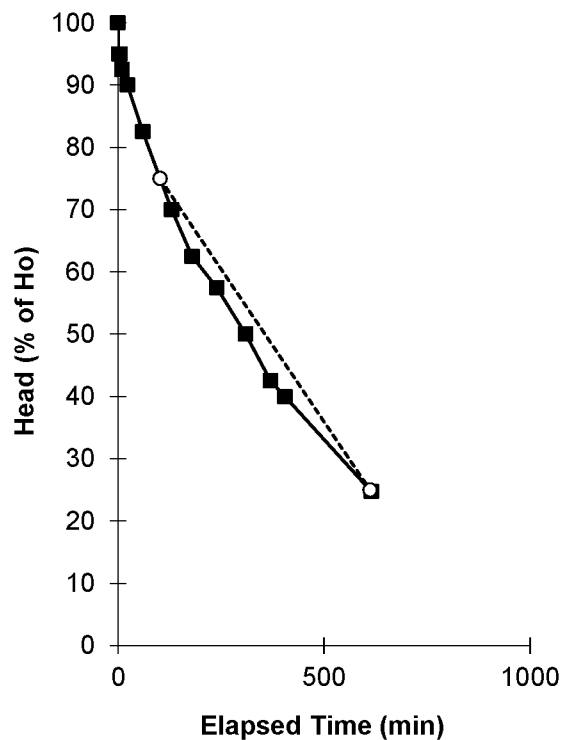
Trial Pit Log (include details of groundwater):

0.0-0.3 - Grass over brown soft silty CLAY (TS)
0.3-0.6 - Brown silty CLAY.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.20	0	100	0.40
0.22	2	95	0.38
0.22	4	95	0.38
0.22	5	95	0.38
0.23	10	93	0.37
0.24	23	90	0.36
0.27	60	83	0.33
0.32	130	70	0.28
0.35	180	63	0.25
0.37	240	58	0.23
0.40	310	50	0.20
0.43	370	43	0.17
0.44	405	40	0.16
0.50	615	25	0.10

T75	102.000	75
T25	611.557	25
T75-25	509.557	Derived from Best Fit



Comments

Final data point extrapolated. Infiltration rate should be considered indicative only.

GROUND CONDITION CONSULTANTS LTD

10 Waldegrave Close
Southampton, SO19 9RY

Soakaway Calculations

Soakaway Test No. SA203 - Test 3
 Contract: Yapton
 Contract No. J20-043

Field Test

Depth of Pit 0.60 m
 Width of Pit 0.50 m
 Length of Pit 1.00 m
 Depth of Pit Soaked 0.40 m

ap50 1.1 m²
 Vp75-25 0.1 m³
 t75-25 264.6 min
 water used 0.2000 m³
 f 5.725E-06 m/sec.

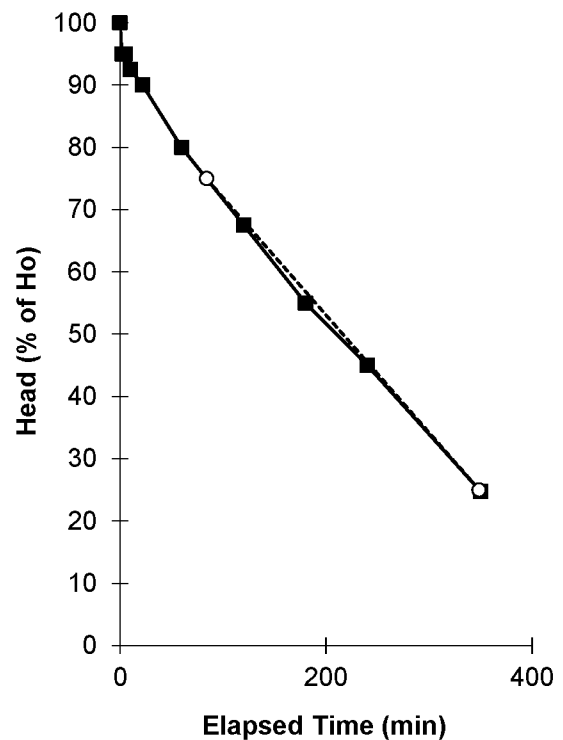
Trial Pit Log (include details of groundwater):

0.0-0.3 - Grass over brown soft silty CLAY (TS)
 0.3-0.6 - Brown silty CLAY.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.20	0	100	0.40
0.22	2	95	0.38
0.22	4	95	0.38
0.22	5	95	0.38
0.23	10	93	0.37
0.24	22	90	0.36
0.28	60	80	0.32
0.33	120	68	0.27
0.38	180	55	0.22
0.42	240	45	0.18
0.50	350	25	0.10

T75 84.000 75
 T25 348.642 25
 T75-25 264.642 Derived from Best Fit



Comments

GROUND CONDITION CONSULTANTS LTD

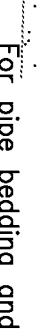
10 Waldegrave Close
 Southampton, SO19 9RY

SCALE 1: 20



1. *Introduction*

SCALE 1: 20



XXXXXXXXXXXX

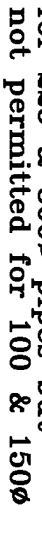
(1:10)



SCALE 1:2



U



in 100mm layers

in 100mm layers.

225 & 300ø pipes

- licence is in place.

1-6-270	Proposed Permavoid base level

STRUCTURAL, CIVIL AND BUILDING CONSULTANTS

2000

[illegible]

Job No.:
Job Name: **The Steddles, Yapton**

**Average soil infiltration rate
Permeable car parking areas**

Test	Result	Ref.	Area (m2)	Ref.	Area (m2)
Location 1 Min.	3.95E-06	Unit 1	85	Access Road	531
Location 2 Min.	6.75E-06	Unit 2	86		
Location 3 Min.	5.73E-06	Unit 3	86		
Min	3.95E-06	Unit 4	95		
		Unit 5	95		
		Unit 6	52.5		
		Unit 7	52.5		
FOS	3.00	Unit 8	86.5		
		Unit 9	98		
Use infiltration rate	1.32E-06 Min	Unit 10	98		
		Unit 11	87		

Soakaway Design

Job No.:
Job Name: **The Steddles, Yapton**

Car park + driveway + roots

Area	50 m2
Run off Coeff	1 m2
	50 m2

100 year return period + 40% CC		Storm duration (Min.)	I	N	F
R5	0.03242 m	5	0.051833	0.1	0.021154
R10	0.04017 m	10	0.188607	0.1	0.029824
R15	0.04546 m	15	0.25	0.1	0.182473
R30	0.05603 m	30	0.5	0.1	0.542122
R60	0.06888 m	60	1	0.1	0.6492
R120	0.08450 m	120	2	0.1	0.860356
R240	0.10348 m	240	4	0.1	0.971317
R360	0.11643 m	360	6	0.1	0.983168
R600	0.13500 m	600	10	0.1	0.98432
R1440	0.17376 m	1440	24	0.1	0.124113

Inflow to attenuation system

I5	1.621 m3
I10	2.009 m3
I15	2.273 m3
I30	2.802 m3
I60	3.444 m3
I120	4.225 m3
I240	5.174 m3
I360	5.822 m3
I600	6.750 m3
I1440	8.688 m3

Outflow from Tank

f 1.32E-06 m3/s (From site investigation)

Soakaway dims:

Plan area	50 m (Area of driveway to be used as storage blanket)
	1 m

Depth 0.3 m (below invert depth of inlet pipe)

As50 50 (Base area only)

Void ratio 30 % (Permavoid or similar system)

Outflow from Tank:

O5	0.02 m3
O10	0.04 m3
O15	0.06 m3
O30	0.12 m3
O60	0.24 m3
O120	0.47 m3
O240	0.95 m3
O360	1.42 m3
O600	2.37 m3
O1440	5.69 m3

Storage required:

		Time to drain:	
S5	1.60 m3	ts50	3.38 hours
S10	1.97 m3	ts50	4.15 hours
S15	2.21 m3	ts50	4.67 hours
S30	2.68 m3	ts50	5.66 hours
S60	3.21 m3	ts50	6.77 hours
S120	3.75 m3	ts50	7.91 hours
S240	4.23 m3	ts50	8.92 hours
S360	4.40 m3	ts50	9.28 hours
S600	4.38 m3	ts50	9.24 hours
S1440	3.00 m3	ts50	6.33 hours

Storage provided 4.5 m3

Critical storm = S360

Storage required = 4.40

Time to discharge= 9.28 Hours (Should be less than 24 hours)

Soakaway size proposed is satisfactory

Location	Stratum	Trial Pit Base Depth	Infiltration Rate (m/sec)	Notes
SA201 Test 1	Silt	0.6m	3.95 x 10 ⁻⁶	Final data point extrapolated. Indicative only
SA201 Test 2		0.6m	9.02 x 10 ⁻⁶	Test complete
SA201 Test 3		0.8m	8.92 x 10 ⁻⁶	Test complete

Location	Stratum	Trial Pit Base Depth	Infiltration Rate (m/sec)	Notes
SA202 Test 1	Silty Clay	0.6m	6.75 x 10 ⁻⁶	Test complete
SA202 Test 2	Silty Clay	0.6m	1.44 x 10 ⁻⁵	Test complete
SA202 Test 3	Silty Clay	0.6m	1.07 x 10 ⁻⁵	Test complete

Location	Stratum	Trial Pit Base Depth	Infiltration Rate (m/sec)	Notes
SA203 Test 1	Silty Clay	0.6m	4.14 x 10 ⁻⁵	Final data point extrapolated. Indicative only
SA203 Test 2	Silty Clay	0.6m	2.97 x 10 ⁻⁵	Final data point extrapolated. Indicative only
SA203 Test 3	Silty Clay	0.8m	5.73 x 10 ⁻⁵	Test complete

TABLE 25.2 Suggested factors of safety, F, for use in hydraulic design of infiltration systems (designed using British Standard BS5936). Items not relevant for BRE material

Size of area to be drained	Consequences of failure		
	No damage or inconvenience	Minor damage to external areas or inconvenience (eg surface water on car parking)	Damage to buildings or structures, or major inconvenience (eg flooding of roads)
< 100 m²	1.5	2	10
100–1000 m²	1.5	3	10
> 1000 m²	1.5	5	10

Job No.:
Job Name: **The Steddles, Yapton**

**Average soil infiltration rate
For carpark and roof design soakaway blanket**

Test	Result
Location 1 Min.	3.95E-06
Location 2 Min.	6.75E-06
Location 3 Min.	5.73E-06
Min	3.95E-06
FOS	3.00
Use infiltration rate	1.32E-06 Min

Area drainage to the soakaway

Ref.	Area (m2)	Ref.
Unit 1	85	Access Road
Unit 2	86	
Unit 3	86	
Unit 4	95	
Unit 5	95	
Unit 6	52.5	
Unit 7	52.5	
Unit 8	86.5	
Unit 9	98	
Unit 10	98	
Unit 11	87	

Area (m2) 531

Location	Stratum	Trial Pit Base Depth	Infiltration Rate (m/sec)	Notes
SA201 Test 1	Silt	0.6m	3.95 x 10 ⁻⁶	Final data point extrapolated. Indicative only
SA201 Test 2		0.6m	9.02 x 10 ⁻⁶	Test complete
SA201 Test 3		0.8m	8.92 x 10 ⁻⁶	Test complete

Location	Stratum	Trial Pit Base Depth	Infiltration Rate (m/sec)	Notes
SA202 Test 1	Silty Clay	0.6m	6.75 x 10 ⁻⁶	Test complete
SA202 Test 2	Silty Clay	0.6m	1.44 x 10 ⁻⁵	Test complete
SA202 Test 3	Silty Clay	0.6m	1.07 x 10 ⁻⁵	Test complete

Location	Stratum	Trial Pit Base Depth	Infiltration Rate (m/sec)	Notes
SA203 Test 1	Silty Clay	0.6m	4.14 x 10 ⁻⁶	Final data point extrapolated. Indicative only
SA203 Test 2	Silty Clay	0.6m	2.97 x 10 ⁻⁶	Final data point extrapolated. Indicative only
SA203 Test 3	Silty Clay	0.8m	5.73 x 10 ⁻⁶	Test complete

TABLE 25.2: Suggested factors of safety, F, for use in hydraulic design of infiltration systems (designed using British Standard BS5936). (Note not relevant for BRE method)			
Size of area to be drained	Consequences of failure		
	No damage or inconvenience	Minor damage to external areas or inconvenience (eg surface water on car parking)	Damage to buildings or structures, or major inconvenience (eg flooding of roads)
< 100 m²	1.5	2	10
100–1000 m²	1.5	3	10
> 1000 m²	1.5	5	10

Soakaway Design					
Job No.:					
Job Name: The Steddles, Yapton					
Carpark + driveway + roofs					
Area	1452.5 m2				
Run off Coeff	1 m2				
	1452.5 m2				
100 year return period + 40% CC		Storm duration (Min.)	I	N	F
R5	0.03242 m	5	0.051833	0.1	0.023154
R10	0.04017 m	10	0.188607	0.1	0.029824
R15	0.04546 m	15	0.25	0.1	0.182473
R30	0.05603 m	30	0.5	0.1	0.542122
R60	0.06888 m	60	1	0.1	0.6492
R120	0.08450 m	120	2	0.1	0.860356
R240	0.10348 m	240	4	0.1	0.971317
R360	0.11643 m	360	6	0.1	0.983368
R600	0.13500 m	600	10	0.1	0.98432
R1440	0.17376 m	1440	24	0.1	0.124113
Inflow to attenuation system					
I5	47.083 m3				
I10	58.349 m3				
I15	66.034 m3				
I30	81.385 m3				
I60	100.047 m3				
I120	122.733 m3				
I240	150.310 m3				
I360	169.122 m3				
I600	196.095 m3				
I1440	252.383 m3				
Outflow from Tank					
f	1.32E-06 m3/s	(From site investigation)			
Soakaway dims:					
Plan area	531 m (Area of driveway to be used as storage blanket)				
	1 m				
Depth	0.4 m (below invert depth of inlet pipe)				
As50	531 (Base area only)				
Void ratio	95 % (Permavoid or similar system)				
Outflow from Tank:					
O5	0.21 m3				
O10	0.42 m3				
O15	0.63 m3				
O30	1.26 m3				
O60	2.52 m3				
O120	5.03 m3				
O240	10.07 m3				
O360	15.10 m3				
O600	25.17 m3				
O1440	60.41 m3				
Storage required:		Time to drain:			
S5	46.87 m3	ts50	9.31 hours		
S10	57.93 m3	ts50	11.51 hours		
S15	65.40 m3	ts50	12.99 hours		
S30	80.13 m3	ts50	15.92 hours		
S60	97.53 m3	ts50	19.37 hours		
S120	117.70 m3	ts50	23.38 hours		
S240	140.24 m3	ts50	27.86 hours		
S360	154.02 m3	ts50	30.60 hours		
S600	170.93 m3	ts50	33.95 hours		
S1440	191.98 m3	ts50	38.14 hours		
Storage provided		201.8	m3		
Critical storm = S1440					
Storage required =		191.98			
Time to discharge=		23.38	Hours (Should be less than 24 hours)		
Soakaway Blanket size proposed is satisfactory					

SUDS MAINTENANCE MANUAL FOR PROPOSED DEVELOPMENT AT THE STEDDLES YAPTON

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1. Introduction

1.1. This document has been prepared by Cowan Consultancy Limited (CCL) on behalf of Elberry Homes for the proposed development to the land at The Steddles in Yapton.

1.2. This document sets out the principles for the long term management and maintenance of the proposed surface water Sustainable Drainage Systems (SuDS) installed at the residential development.

1.3. The purpose of this document is to ensure that the site user / management company entrusted with the inspection and maintenance of the SuDS will adopt the measures and programme set in this document to ensure the optimum operation of the surface water drainage network. The SuDS are to be continuously maintained over the lifetime of the development to prevent the increased risk of flooding both on and off site.

1.4. The guidance notes here provided have been comprised of and are directly referenced from the latest technical SuDS guidance within the CIRIA C753 Report *The SuDS Manual* (2015) and other applicable guidance. This document sets out specific sections applicable to the relevant SuDS type itemising:

1. A description of the SuDS component and its use;
2. The maintenance requirements and frequencies; and
3. The inspection requirements and frequencies.

1.5. The activities listed are generic to the relative SuDS types and represent the minimum maintenance and inspection requirements, however additional tasks or varied maintenance frequency may be instructed by the maintenance company as required. Rubbish and debris removal is also an integral part of SuDS maintenance, especially with regards to surface features and the reduction of the risks of inlet and outlet blockages.

1.6. Specific maintenance needs of the SuDS elements should be monitored and maintenance schedules adjusted to suit requirements.

1.7. All those responsible for maintenance should follow relevant health and safety legislation for all activities listed within this report (including lone working, if relevant) and risk assessments should always be undertaken.

1.8. This report is to read in conjunction with CCL drawing '424795/01 and 02: Drainage GA layout and details for the location of all SuDS on this site.

1.9. There are three categories of maintenance activities referred to in this report:

- **Regular maintenance** (including inspections and monitoring) – consisting of basic tasks done on a frequent and predictable schedule, including inspections and monitoring, silt or oil removal if required more frequently than once per year, vegetation management, rubbish and debris removal, and sweeping of surfaces. Regular maintenance/inspections of SuDS will help to:

- determine optimum future maintenance;
- establish ongoing hydraulic, water quality, amenity and biodiversity performance of the system; and
- allow for the identification of potential performance failures, such as blockage, reduced infiltration and poor water quality resulting from lack of maintenance.

- **Occasional maintenance** – comprising tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks such as sediment management/removal; and

- **Remedial maintenance** – comprising of intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by regular and adequate maintenance activities. Remedial maintenance is likely to comprise of activities such as:

- erosion repairs which can include inlets and outlets;
- reinstatement or realignment of edgings, barriers, rip-rap or other erosion control;
- infiltration surface rehabilitation;
- replacement of blocked filter materials/fabrics;
- construction stage sediment removal (although this activity should have been undertaken before the start of the maintenance contract); and
- system rehabilitation (although unlikely) immediately following a pollution event.

Remedial activities are not expected to be required for all systems, however, for the purpose of estimating whole life maintenance costs, a contingency sum of 15–20% should be added to the annual regular and occasional maintenance costs to cover the risk of these activities being required. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.

- 1.10. During the first year of operation inspections should usually be carried out at least monthly to all types of SuDS, and after significant storm events, to ensure that the system is functioning as designed and that no damage is evident.

2. SuDS Layout and Design

SuDS are an environmentally friendly approach to managing rainfall through the use of landscape features to conceal the surface water and its surroundings. The use of SuDS aims to: control the flow, volume and frequency of water leaving a development area; prevent pollution by intercepting silt and cleaning runoff from hard surfaces; provide attractive surroundings for the community, and; create, whenever possible, opportunities for wildlife.

The SuDS at The Steddles were designed to prevent flooding of Land on the site itself and adjacent areas and control discharge via underground drainage systems. There are four main SuDS components incorporated within the surface water drainage strategy:

1. Permavoid Stormwater units (Soakaway)
2. Permeable parking areas

2.1. The Permavoid soakaway *tanking*, positioned within the driveway area will be used as the main SuDS system catering for the surface water of the building roof and the road hard standing. Stormwater systems do not provide direct treatment of surface water runoff, therefore, the system will be combined in a Management Train with other methods to provide suitable treatment.

- Drainage will be carried via drain pipe connected to manholes and subsequently to the soakaways;
- Storage will be provided by Permavoid units (or similar approved voided units);
- Surface water treatment will be carried out on the sump manhole preceding the soakaway;
- All manholes preceding the soakaway will incorporate a silt trap;
- The system has been designed for the 1 in 100 years, including extra 40% allowance for climate change, design storm as required by current regulations.

2.2. The permeable surfacing on the site will be constructed using a permeable block system incorporating permeable concrete Aquaflo blocks. These permeable areas will be utilised to drainage the access roads into the site and between the permeable gravel surfaced parking bays. The attenuation of this system including the calculated depth of voided storage will provide adequate surface water treatment levels as detailed within the drainage assessment report.

3. SuDS Maintenance and Management

3.1. SUDS items

3.1.1. Rubbish, debris and gravel removal should be undertaken as part of general pavement maintenance for the site.

3.1.2. Replacement of the aggregate or Permavoid units will be necessary if the system becomes blocked with silt, monitoring will give information on possible changes.

3.1.3. Table 3.2 provides guidance on the type of operational and maintenance requirements. The list of actions is not exhaustive and some actions may not always be required.

3.1.4. Specific maintenance needs of the SUDS should be monitored, and maintenance schedules adjusted to best suit site requirements.

3.1.5. Maintenance responsibility for systems should be placed with either a responsible organisation such as a management company or property owners served by the so

Soakaway tanking operation and Maintenance Requirements

<i>Maintenance Schedule</i>	<i>Required action</i>	<i>Typical frequency</i>
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube, sump or chamber and inside of crate units	Annually
	Cleaning of gutters and any filters on downpipes	Annually or as required
	Trimming any roots that may be causing blockages	Annually or as required
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube, sump or chamber and inside of crate units	As required, based on inspections
Remedial actions	Reconstruct attenuation unit / soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check Attenuation tank to ensure emptying is occurring	Annually

Permeable Pavement operation and Maintenance Requirements

<i>Maintenance Schedule</i>	<i>Required action</i>	<i>Typical frequency</i>
Regular maintenance	Remove rubbish and debris	Monthly, or as required
	Remove any vegetation growth	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Biannual
Occasional maintenance	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required - once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	As required
	Remove build-up of sediment on areas running off into permeable areas	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

In the event of concern over any matter please contact the **Elberry Homes or the appointment maintenance company**

Approved by:

Prepared by:

Elvin Gomery | BEng (Hons)

Senior Structural Engineer

David

Princi

Managing Director

Ref.: 424795

Proposed Development The Steadies, Yapton

SuDS Maintenance & Management Plan

02 December 2020

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EG/424994/eg

4th December 2020

Mr S Mackley
12 Northgate
Chichester
West Sussex
PO19 1BA

Dear Stuart

Re: THE STEDDLES, YAPTON – DRAINAGE DESIGN

I have attached our drainage calculations to deal with the drainage relating planning conditions.

The attached drawing includes detailed drainage information for the site proposal and drainage details for the areas of works.

There is a driveway soakaway formed with Permavoid units which will provide adequate storm water storage based upon the soakaway Testing carried out on site. We have also attached calculations for the Storage soakaway blanket within the access road and the permeable paving proposed for driveways.

Please feel free to contact me should you need to discuss anything or need any further information.

Yours Sincerely

Elvin Gomery

For and on behalf of Cowan Consultancy

Structural Engineering

Timber Framed Buildings

Heritage Buildings

Structural Inspections

Subsidence

Party Wall Surveyors

Civil Engineering

Roads & Drainage

Site Investigations

Contaminated Land

Site Stability Reports

Flood Risk Assessments

Project Management

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