

**STONE CONSULTING
ENGINEERS LTD.**

**CONSULTING CIVIL, STRUCTURAL AND
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Job No. 1870

Date: Mar 2019

QA INFORMATION

CLIENT:	Aaron Millar
JOB ID:	37 Hill Lane. Barnham
SCOPE OF WORK:	Soakaway Design
DESIGN CODES AND REFERENCES:	BRE 365 The Building Regulations
SOFTWARE:	MS EXCEL
SUB-SOIL/ FOUNDATION DATA:	N/A

MATERIAL DATA

CONCRETE:	
REINFORCEMENT:	
STEELWORK:	
TIMBER:	
OTHER:	Percolation testing carried out on site

OTHER INFORMATION / NOTES

Rev -	01 /19	Prelim
Rev A	03 /19	Undated with percolation test results

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Project:	37 Hill Lane. Barnham	Date:	Mar 2019	Made by:	KS	Sheet No.	1
CALCULATION SHEET		Job No.	1870	Chkd:	-	Rev.	0

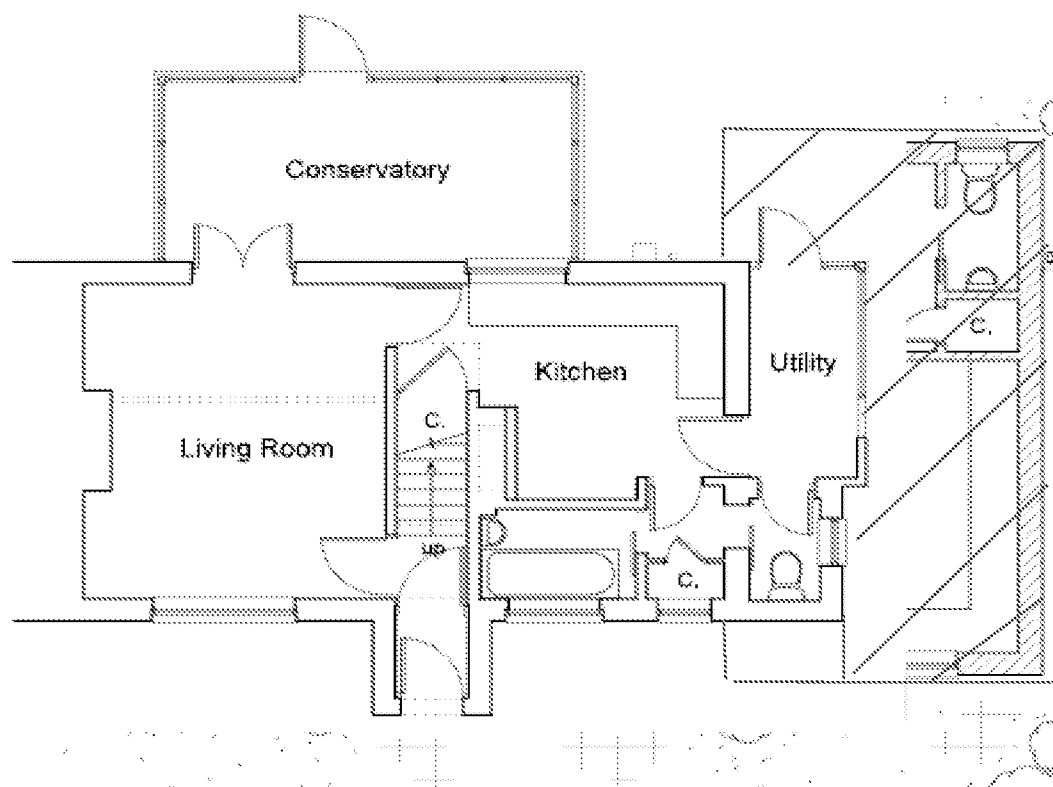
Summary:

The site is underlain by 'Brickearth' . Groundwater monitoring on the an adjacent site recorded a maximum winter (march) water table at a depth of 3.6m bgl.

The calculation is based on a 100 year return period with a 40% allowance for Climate Change.

The infiltration rates have been established from the percolaton tests carried out at the location of the proposed soakaway in accordance with Building Regulations H2 (cl 1.34-1.37).

For the proposed soakaway pit the storage volume of 0.8m3 formed from 4 No. crates provides adequate storage and soakaway performance..



New roof area (shown hatched) = **23.20** m2

Percolation test in accordance with Buildign Regulations H2 cl 1.34-1.37

	Test 1	Test 2	Test 3
Time to drain 75 - 25 %	5.50	6.50	6.00
Average =	6.00 mins	=	360.00 secs
Calculated Vp value =	2.40 mm/sec		
Infiltration rate = (0.001)/Vp =	4.17E-04 m/s		

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Project: 37 Hill Lane. Barnham	Date: Mar 2019	Made by: KS	Sheet No. 2
CALCULATION SHEET	JobNo. 1870	Chkd: -	Rev. 0

SOAKAWAY DESIGN TO BRE(1991)

SOAKAWAY DETAILS

Ring		Pit/crates	
Soakaway size, Ds =	2.10 m	Length =	1 m
Depth of below invert, Hs =	1.50 m	Width =	1 m
		Depth below invert =	0.8 m
Free volume, S =	5.20 m ³		= 0.80 m ³
Rubble filled volume, S' =	1.56 m ³		= 0.26 m ³

INITIAL SOAKAWAY SIZING

Drained area to soakaway = 23.20 m²
 Climate change allowance = 40 %

INFLOW

Inflow, I = (run off area) x (design rainfall)
 = A x (M10-D)

DESIGN RAINFALL

Return period = 100 yrs
 Ratio of 60 min to 2-Day rainfalls of 5 year return period, r = 0.35 BRE(1991) Fig 1.

M5 rainfalls are calculated from table 1 (BRE 365) using Z1 factor

Storm duration (hrs)	Storm duration (mins)	Z1	M5-D (mm)	Z2 M10 (cor. Fac)	M10-D* rainfall	Z2 M100 Design	100 yr + 40%	
							rainfall	
0	5	0.36	7.2	1.19	12.00	1.84	18.55	
0	10	0.54	10.8	1.22	18.45	1.92	29.03	
0	15	0.65	13	1.23	22.39	1.96	35.67	
1	30	0.82	16.4	1.22	28.01	2.00	45.92	
1	60	1	20	1.24	34.72	2.03	56.84	
2	120	1.19	23.8	1.24	41.32	2.01	66.97	
4	240	1.39	27.8	1.22	47.48	1.97	76.67	
6	360	1.53	30.6	1.21	51.84	1.94	83.11	
10	600	1.7	34	1.2	57.12	1.90	90.44	
24	1440	2.07	41.4	1.18	68.39	1.81	104.91	
36	2160	2.38	47.6	2.18	145.28	1.75	116.62	

* including 40% for climate change

OUTFLOW

Soil infiltration rate*, f = 4.17E-04 m/sec
 effective storage depth, a(50) = H x .5 = 0.75 m (ring)
 Outflow /sec = 3.142 x Dia x a(50) = 2.06E-03 m3/sec (ring)
 effective storage depth, a(50) = H x .5 = 0.4 m (pit)
 Outflow /sec = 2(L + W) x a(50) x f = 6.67E-04 m3/sec (pit)

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Project: 37 Hill Lane. Barnham	Date: Mar 2019	Made by: KS	Sheet No. 3
CALCULATION SHEET	JobNo. 1870	Chkd: -	Rev. 0

STORAGE CAPACITY

$$\text{Storage capacity, } S = \text{Inflow} - \text{Outflow}$$

$$= I - O = [A \times (M10-D)] - O$$

		Ring soakaway			Pit/crates soakaway	
Storm duration (hrs)	Storm duration (mins)	Inflow S(1) m ³	Outflow Max m ³	Required capacity m ³	Outflow Max m ³	Required capacity m ³
0	5	0.43	0.82	n/a	0.20	0.23
0	10	0.67	1.24	n/a	0.40	0.27
0	15	0.83	1.86	n/a	0.60	0.23
1	30	1.07	3.71	n/a	1.20	n/a
1	60	1.32	7.42	n/a	2.40	n/a
2	120	1.55	14.84	n/a	4.80	n/a
4	240	1.78	29.69	n/a	9.60	n/a
6	360	1.93	44.53	n/a	14.40	n/a
10	600	2.10	74.22	n/a	24.00	n/a
24	1440	2.43	176.13	n/a	57.60	n/a

Max required capacity = 0.00

Max ring capacity = 6.20 OK

Rubble filled volume = 1.86 OK

= 0.27

Free volume = 0.80 OK

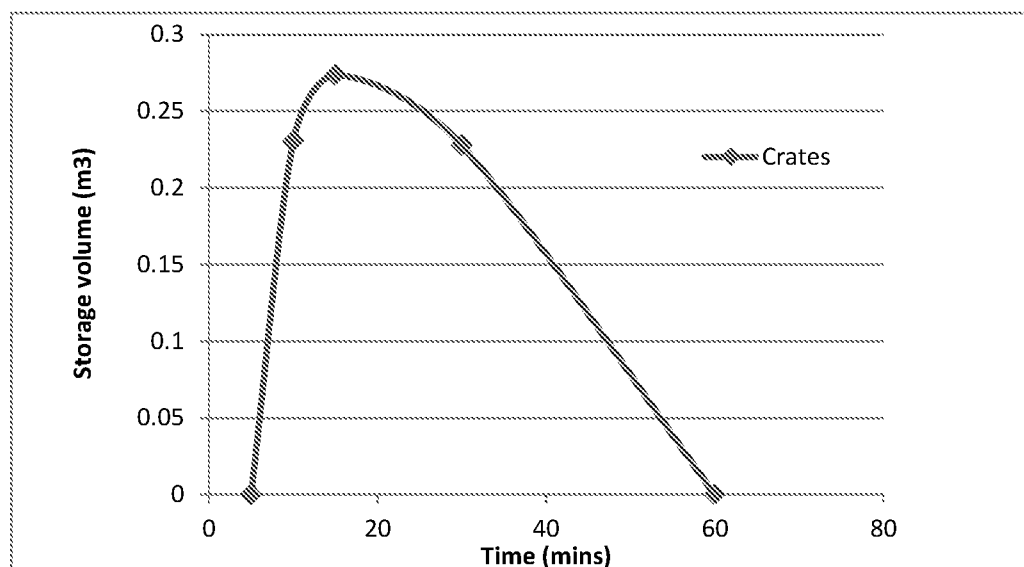
Rubble filled volume = 0.26 FAIL

Storage volume

Ring soakaway				Status
Diameter	2.10	m	Unfilled	OK
Depth below invert =	1.50	m	Filled	OK

Pit or trench

		Status
Length =	1.00 m	Unfilled OK
Width =	1.00 m	Filled FAIL
Depth below invert =	0.8 m	



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Project: 37 Hill Lane. Barnham	Date: Mar 2019	Made by: KS	Sheet No. 4
CALCULATION SHEET	JobNo. 1870	Chkd: -	Rev. 0

Typical installation procedure for AquaCell Eco (or similar) crated

1. Excavate the trench to the required depth ensuring that the plan area is slightly greater than that of the AquaCell units.
2. Lay 100mm bed of coarse sand or non angular granular material, level and compact.
3. Lay the geotextile over the base and up the sides of the trench.
4. Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bonded' formation (i.e. to overlap the joints below). For single layer applications use the AquaCell Clips and for multi layers use the AquaCell Clips and the AquaCell Shear Connectors (vertical rods).
5. Fit the Adaptors to the AquaCell units as required and connect pipework.
6. In order to prevent silt from entering the tank, clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or the standard Silt Trap (6LB600) is installed prior to the inlet pipework.
7. Wrap and overlap the geotextile covering the entire AquaCell structure.
8. Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
9. Lay 100mm of coarse sand or non angular granular material over the geotextile and compact.
10. Backfill with suitable material.
11. Rainwater from roof areas may discharge directly into the soakaway but rainwater from carparks must discharge through a catchpit manhole and/or a petrol interceptor.

SUMMARY:

The design indicates a single soakaway located in the rear garden would be sufficient to cater for the small additional run-off from the house extension.

A typical arrangement using 4 AquaCell or similar crates of 1 x 0.5 x 0.4 (high) installed in the rear garden in accordance with manufacturers recommendations (see above for example requirements).