

**15-17 KEW GARDENS
BOGNOR REGIS
WEST SUSSEX
PO21 5RD**

**PRELIMINARY SURFACE WATER DRAINAGE
DESIGN STRATEGY**

CLIENT:

VIVID DESIGN STUDIO

TDB/414504/djb

27 September 2019

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1.0 INTRODUCTION

1.1 These calculations have been prepared by Cowan Consultancy Limited (CCL) on behalf of Vivid Design Studio, The Barn, Calcot Mount Business Park, Calcot Lane, Curdridge, Southampton, SO31 2BN.

1.2 The surface water drainage design has been prepared for the purposes of planning approval. Therefore this is not a final design for construction.

1.3 GEOLOGY OF THE AREA

1.3.1 The site lies on OS grid reference (Eastings) 491770 (Northings) 100095 and Site GPS Coordinates 50.793167, -0.69933170.

1.3.2 By reference to the IGS 1 to 50000 series geological drift edition map it can be seen that the site would be expected to lie within Lambeth Group – Clay, Silt and Sand with overlying River Terrace Deposits (undifferentiated) of Sand, Silt and Clay.

1.4 SITE DESCRIPTION

1.4.1 The site for the proposed development consists of approximately 0.20 acres of brownfield site. Immediately to the West of the site is Bognor Regis Fire Station. The other three sides are surrounded by residential properties of Kew Gardens

1.4.2 The site consists of 6no. semi-detached houses with parking to the sides and gardens to the rear.

2.0 SURFACE WATER DRAINAGE DESIGN

- 2.1 Due to the constraints of the site from being brownfield and mainly made up of hard standings, then it was deemed impractical to carry out infiltration testing on site at this pre planning stage.
- 2.2 Infiltration rates for these calculations have been determined from test results which were obtained from representative sites within close proximity to Kew Gardens. As indicated by the IGS series geological drift edition map, the example sites are lying within the same geology, so we believe these are an accurate enough representation at this stage.
- 2.3 From the representative sites the worst value obtained for the infiltration rate was 1.8×10^{-5} m/s, therefore this is the value which will be adopted for this initial design.
- 2.4 Site specific testing will be required at a later stage, before any construction commences, to confirm the accuracy of the infiltration rate used.
- 2.5 The soakaway will be designed to contain surface runoff for 1 in 100 year storm + 40% climate change allowance. In accordance with the SuDS Manual Ciria 753, a factor of 1.5 will be applied to the infiltration rate.
- 2.6 For the purpose of the soakaway design it is intended that the surface water is only being collected from the roofs of the proposed buildings.
- 2.7 At this stage, it is assumed that parking and access surfaces are to be permeable.

3.0 **PROPOSED SURFACE WATER DRAINAGE**

- 3.1 It has been calculated that a soakaway storage capacity of 31.9m³ is required. Therefore soakaways with a total size of 21x2.0x0.8m have been proposed.
- 3.2 As indicated on Drawing No. 414504/200P, due to the constraints of the site layout, the gardens of plots 1, 2 & 6 can't accommodate a soakaway. Therefore the total capacity required from the site has been split into soakaways located in three separate gardens (Plots 3, 4 & 5).
- 3.3 The soakaways are split at each plot boundary and linked with 100mm diameter pipe. This is to limit the chance of any risk of damage from works to the boundary (fence post digging etc.). On final design, precautions should be made to mitigate this risk further.

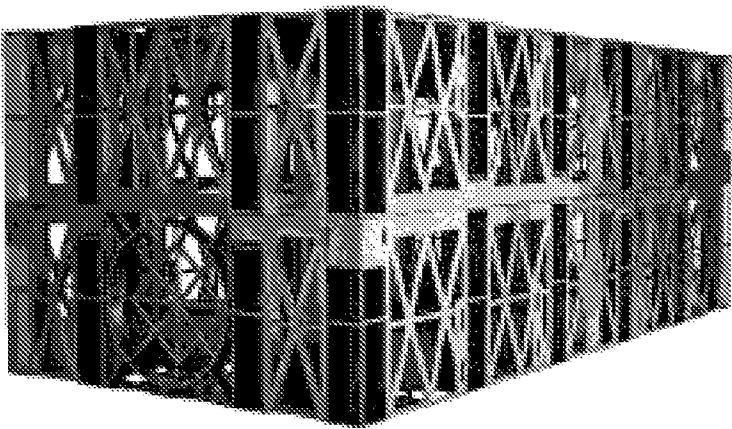
APPENDIX A

Site Plan (soakaway Details)



Proposed Site Plan (1:100)

DO NOT SCALE THIS DRAWING



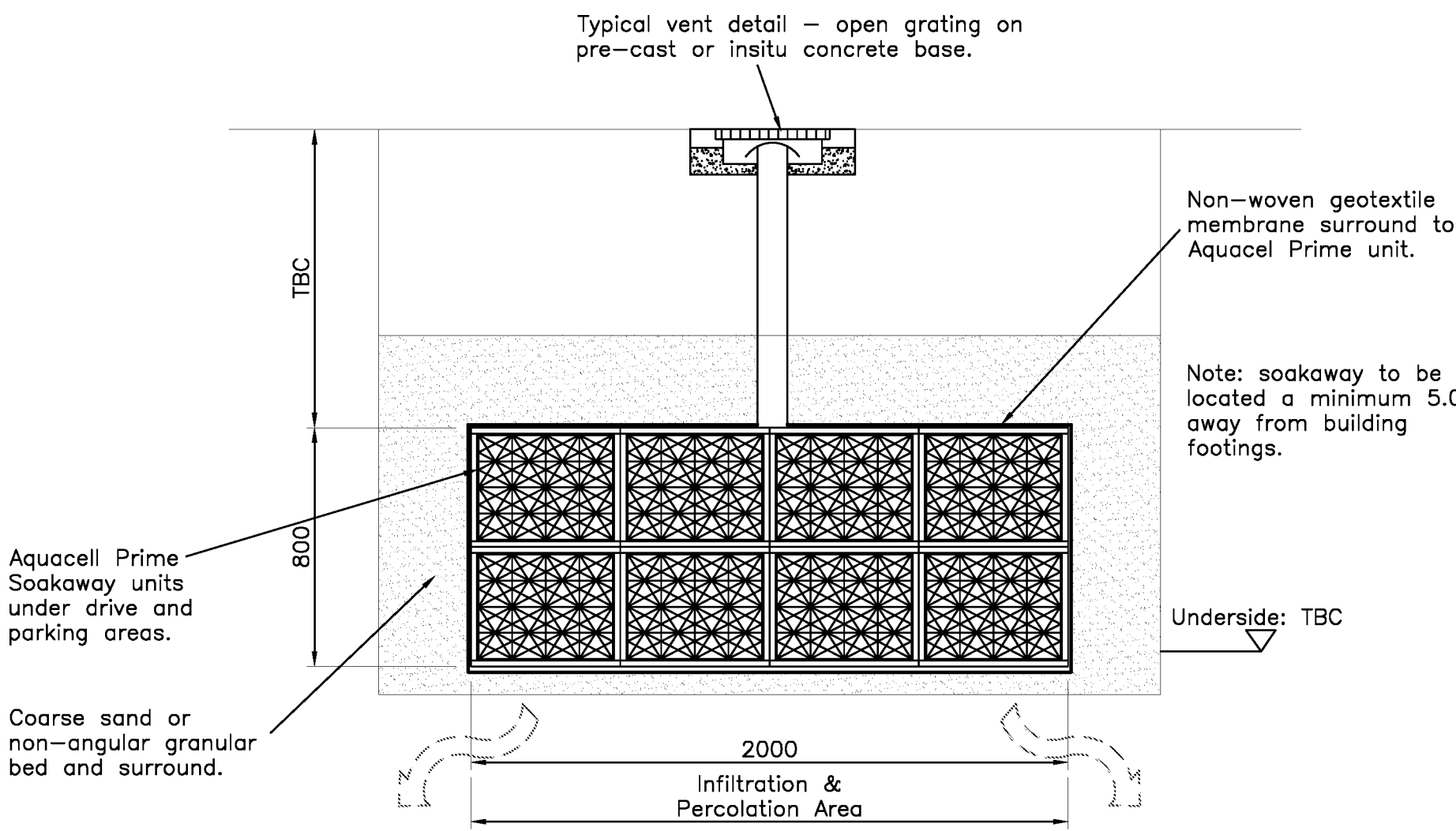
Provide 4no. soakaways with total length, 21m long x 2m wide x 0.8m deep soakaway. Soakaways connected together with 100 dia pipes.

1000lg x 500w x 400dp
AquaCell ECO unit

Soakaway - 168 total units

NOTES

1. This drawing is to be read in conjunction with all relevant Engineers drawings and specifications.
2. All dimensions are in millimetres unless noted otherwise.
3. The Contractor is responsible for the setting out and for checking all dimensions.
4. In accordance with The Construction (Design and Management) Regulations 2015 (CDM 2015) the Principal Designer and Contractor are to:
 - Notify HSE of works.
 - Comply with the requirements of Health and Safety Plan (if applicable)
 - Provide risk assessments and method statements for all potential hazards relevant to this project.



TYPICAL SECTION
STORM WATER SOAKAWAY DETAIL
1:20

[illegible]

APPENDIX B

Soakaway Design Calculations

Job No.	414504	Sheet		Date	Sept'19
Job	15-17 Kew Gardens	By	CMW	Checked	TB

Soakaway Design for Proposed Buildings

Area	289.000 m ²	
Run off Coeff	1.400 m ²	(CCA)
	404.600 m ²	

10 year return period

		Storm duration (Min.)
R5	0.009 m	5
R10	0.012 m	10
R15	0.015 m	15
R30	0.020 m	30
R60	0.025 m	60
R120	0.030 m	120
R240	0.036 m	240
R360	0.041 m	360
R600	0.047 m	600
R1440	0.058 m	1440

Inflow to attenuation system

I5	3.52 m ³
I10	5.02 m ³
I15	6.19 m ³
I30	7.93 m ³
I60	10.03 m ³
I120	12.26 m ³
I240	14.69 m ³
I360	16.55 m ³
I600	18.85 m ³
I1440	23.39 m ³

Outflow from Tank

f	1.20E-05 m ³ /s
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Soakaway dims:

Length	11 m
Width	2 m
Depth	0.8 m

As50	10.4
Void ratio	95 %

Outflow from Tank:

O5	0.0374 m ³
O10	0.0749 m ³
O15	0.1123 m ³
O30	0.2246 m ³
O60	0.4493 m ³
O120	0.8986 m ³
O240	1.7971 m ³
O360	2.6957 m ³
O600	4.4928 m ³
O1440	10.7827 m ³

Storage required:

S5	3.48 m ³
S10	4.94 m ³
S15	6.08 m ³
S30	7.71 m ³
S60	9.58 m ³
S120	11.36 m ³
S240	12.89 m ³
S360	13.85 m ³
S600	14.36 m ³
S1440	12.60 m ³

Time to drain:

ts50	3.88 hours
ts50	5.50 hours
ts50	6.76 hours
ts50	8.58 hours
ts50	10.67 hours
ts50	12.64 hours
ts50	14.35 hours
ts50	15.42 hours
ts50	15.98 hours
ts50	14.03 hours

Allowance for extra rain during storage period (assume average rainfall)

Average daily rain	2.60 mm
Extra rain during storage	0.50 m ³

Storage provided	16.7 m ³
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Critical storm =	S600
Storage required =	14.86
Time to discharge =	15.98 Hours

0.67 Days

Proposed soakaway material requires a void ratio ≥90%.

The use of AquaCell Plus stormwater systems is recommended. Proposed design includes for 40% increase due to Climate Change.

Job No.	414504	Sheet	Date	Sept 19
Job	15-17 Kew Gardens	By CMW	Checked	TB

Soakaway Design for Proposed Buildings

Area 289.000 m²
Run off Coeff 1.000 m²
289.000 m²

100 year return period + 40%

		Storm duration (Min.)
R5	0.032 m	5
R10	0.040 m	10
R15	0.045 m	15
R30	0.056 m	30
R60	0.069 m	60
R120	0.084 m	120
R240	0.103 m	240
R360	0.116 m	360
R600	0.135 m	600
R1440	0.174 m	1440

Inflow to attenuation system

I5	9.37 m ³
I10	11.61 m ³
I15	13.14 m ³
I30	16.19 m ³
I60	19.91 m ³
I120	24.42 m ³
I240	29.91 m ³
I360	33.65 m ³
I600	39.02 m ³
I1440	50.22 m ³

Outflow from Tank

f 1.20E-05 m³/s

Soakaway dims:

L	21 m
W	2 m
Depth	0.8 m

As50 18.4

Void ratio 95 %

Outflow from Tank:

O5	0.0662 m ³
O10	0.1325 m ³
O15	0.1987 m ³
O30	0.3974 m ³
O60	0.7949 m ³
O120	1.5898 m ³
O240	3.1795 m ³
O360	4.7693 m ³
O600	7.9488 m ³
O1440	19.0771 m ³

Storage required:

S5	9.30 m ³
S10	11.48 m ³
S15	12.94 m ³
S30	15.80 m ³
S60	19.11 m ³
S120	22.83 m ³
S240	26.73 m ³
S360	28.88 m ³
S600	31.07 m ³
S1440	31.14 m ³

Time to half drain:

ts50	5.85 hours
ts50	7.22 hours
ts50	8.14 hours
ts50	9.94 hours
ts50	12.02 hours
ts50	14.36 hours
ts50	16.81 hours
ts50	18.17 hours
ts50	19.54 hours
ts50	19.59 hours

Storage provided 31.9 m³

Critical storm = S1440

Storage required = 31.14

Time to half discharge= 19.59 Hours (Acceptable time as 1/100 year storm)

Soakaway size proposed is satisfactory

For increase from 10 year storm to 100 year storm use,

Bilham's formula $r \text{ (mm)} = (((1.25T)/N)^{(1/3.55)}) \times 25.4$

T = storm duration in hours

N = No. of storms in 10 years

T	N	r	0.4 10 year return period
0.083333	0.1	0.023154	0.03241527 R5 0.0087 m
0.166667	0.1	0.028694	0.040171329 R10 0.0124 m
0.25	0.1	0.032473	0.045462061 R15 0.0153 m
0.5	0.1	0.040022	0.056031245 R30 0.0196 m
1	0.1	0.0492	0.068879338 R60 0.0248 m
2	0.1	0.060356	0.084497712 R120 0.0303 m
4	0.1	0.073917	0.103483692 R240 0.0363 m
6	0.1	0.083168	0.116434821 R360 0.0409 m
10	0.1	0.10	0.135004879 R600 0.0466 m
24	0.1	0.124113	0.173757739 R1440 0.0578 m