

Evans & Langford LLP

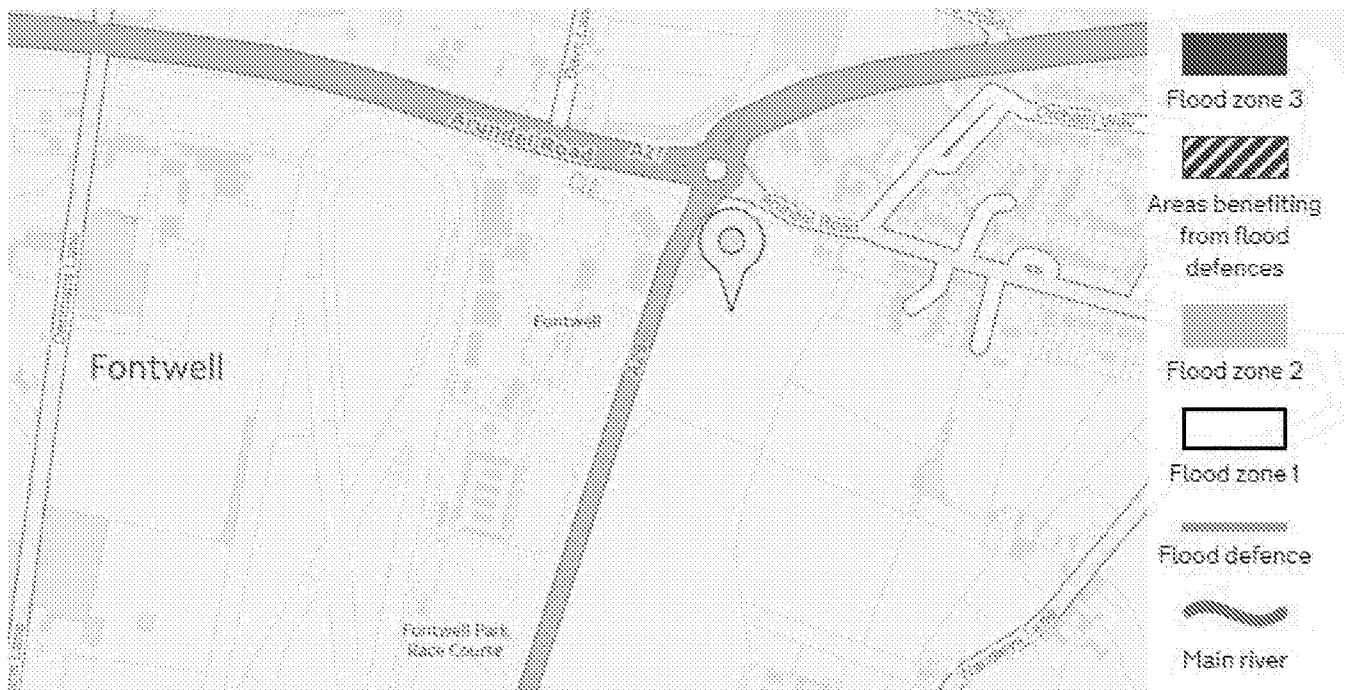
- ◆ Structural & Civil Engineers
- ◆ Land & Building Surveyors
- ◆ Geo-Environmental Engineers
- ◆ Project Managers
- ◆ CDM Consultants
- ◆ Contract Administrators

Surface Water Drainage Strategy – GTR Fontwell

Existing Site

The site for the proposed industrial units is located opposite Fontwell Racecourse approximately 6.5km to the north of Bognor Regis town centre. The site is centred on approximate National Grid Reference 495070, 106975. Currently the site is predominantly green open space.

The site is located in Flood Zone 1 (see below), and recommendations for surface water disposal utilising infiltration Suds are viable.



Extract from Flood Map for Planning (Gov.uk)

Drainage Design

The premise behind the surface water drainage system for GTR Fontwell is that rain falling on to the roof area and hardstandings be collected and channelled via permeable paving and underground pipes to a soakaway which discharges into clean natural gravel.

It is expected that infiltration drainage should be used for surface water, the soil was tested but infiltration rates are still to be finalised. For the purposes of the drainage design, soil infiltration rates appropriate to the soils found on site have been used.



ISO 9001
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In general, the system has been designed in accordance with Non Statutory Technical Standards for Sustainable Drainage Systems, The SUDS Manual C753 by CIRIA and Sustainable Drainage Systems C609 also published by CIRIA. The system has been designed in WinDes Microdrainage to ensure that there is no flooding to any part of the site for all storms up to and including a 1 in 100 year storm, with a 40% allowance for climate change.

Figure 23.4 provides a typical design of a pond in plan view and profile. Figure 23.5 shows typical planted pond edge details and Figure 23.6 shows equivalent details for a typical non-planted pond.

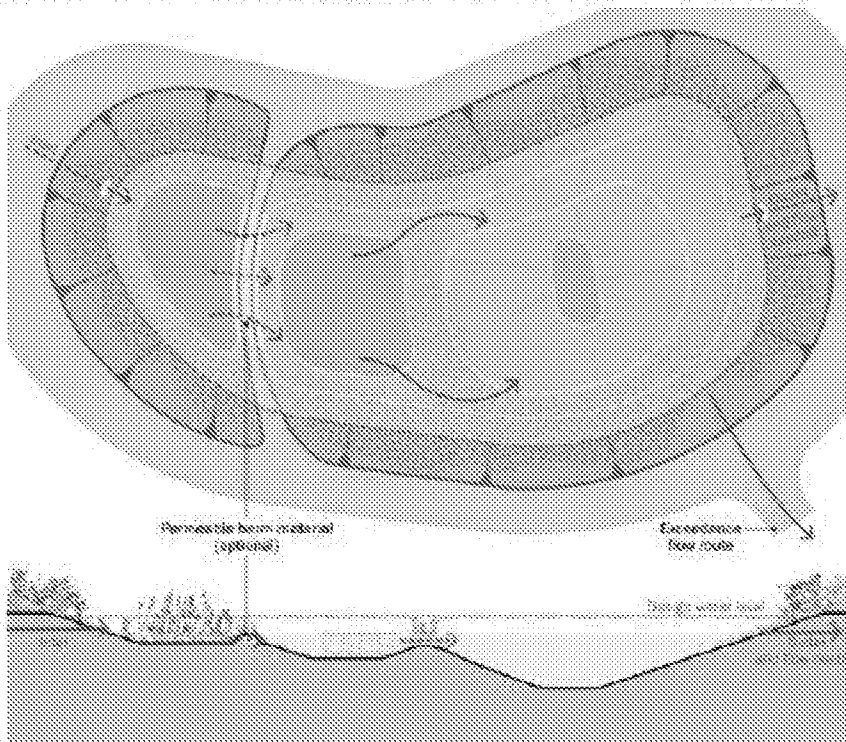


Figure 23.4 Plan view and profile of pond details

CIRIA SUDS Manual 2015

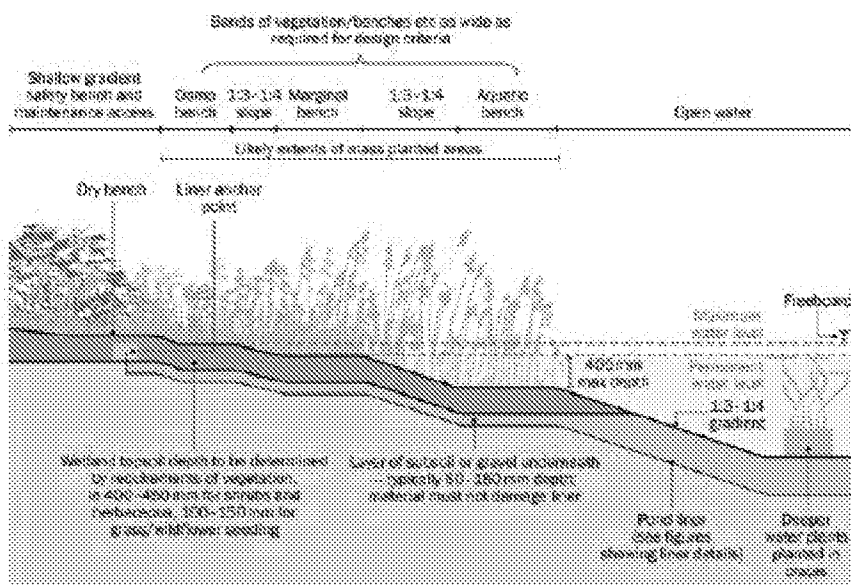


Figure 23.5 Typical planted pond edge details

The design allows for the carpark to the east of the buildings, as well as that in the north west corner, to be constructed with permeable paving. Roof water will also be routed through the paving sub-base to allow for utilisation of infiltration to the underlying soils. The pavements will be provided with overflow structures (such as weirs) that will ultimately discharge through an attenuation pond which in turn overflows into a below ground soakaway located in the south west corner of the site.

The attenuation pond will be designed to provide additional benefits in the form of water quality, amenity and biodiversity through the planting of appropriate aquatic species. It will likely be designed to have a permanent shallow pond to support aquatic wildlife. The Ciria SuDS Manual C753 contains further details, as shown in the extracts above.

Microdrainage calculations have been completed for the 100 year + 40% climate change event and the resulting size of soakaway obtained was 300m² x 0.8m deep. The calculations have been completed with each of the drainage elements cascaded, that is the permeable carparking with overflows into the pond and then soakaway. The half drain time of the carparks are 131 minutes for the top carpark, 283 minutes for the bottom carpark and 1161 minutes for the soakaway.

Catchpits will also be constructed upstream of the soakaways to collect silt and leaves. An oil separator will also be required to remove any pollutants for car parking areas. As with any surface water drainage system, to maintain best performance, regular maintenance and cleaning are required.

Collecting and discharging the surface water as detailed above is considered to be in accordance with the principals of sustainable urban drainage systems.

Revision A
February 2020

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Date 30/01/2020 File 15104 Drainage system c...	Designed by DPM Checked by	
Causeway Source Control 2017.1.2		

Cascade Summary of Results for 15104 Soakaway cascade.SRCX

Upstream Structures	Outflow To	Overflow To
15104 Permeable bottom cascade.SRCX	(None)	(None)
15104 Permeable top cascade.SRCX		

Half Drain Time : 1161 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	23.661	0.161	1.3	46.0	O K
30 min Summer	23.762	0.262	1.3	74.8	O K
60 min Summer	23.869	0.369	1.4	105.1	O K
120 min Summer	23.969	0.469	1.4	133.7	O K
180 min Summer	24.016	0.516	1.4	147.2	O K
240 min Summer	24.041	0.541	1.4	154.2	O K
360 min Summer	24.065	0.565	1.4	161.1	O K
480 min Summer	24.068	0.568	1.4	161.9	O K
600 min Summer	24.065	0.565	1.4	160.9	O K
720 min Summer	24.059	0.559	1.4	159.2	O K
960 min Summer	24.042	0.542	1.4	154.3	O K
1440 min Summer	24.000	0.500	1.4	142.4	O K
2160 min Summer	23.938	0.438	1.4	124.8	O K
2880 min Summer	23.879	0.379	1.4	108.1	O K
4320 min Summer	23.775	0.275	1.3	78.3	O K
5760 min Summer	23.689	0.189	1.3	53.9	O K
7200 min Summer	23.624	0.124	1.3	35.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	127.747	0.0	33
30 min Summer	86.691	0.0	46
60 min Summer	56.129	0.0	74
120 min Summer	35.009	0.0	132
180 min Summer	26.112	0.0	190
240 min Summer	21.070	0.0	250
360 min Summer	15.587	0.0	366
480 min Summer	12.563	0.0	466
600 min Summer	10.618	0.0	518
720 min Summer	9.248	0.0	580
960 min Summer	7.430	0.0	706
1440 min Summer	5.446	0.0	986
2160 min Summer	3.982	0.0	1392
2880 min Summer	3.185	0.0	1792
4320 min Summer	2.319	0.0	2556
5760 min Summer	1.852	0.0	3288
7200 min Summer	1.556	0.0	3960

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Causeway			Source Control 2017.1.2			
<u>Cascade Summary of Results for 15104 Soakaway cascade.SRCX</u>						
	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
	8640 min Summer	23.577	0.077	1.3	21.9	O K
	10080 min Summer	23.549	0.049	1.2	14.1	O K
	15 min Winter	23.697	0.197	1.3	56.2	O K
	30 min Winter	23.811	0.311	1.3	88.7	O K
	60 min Winter	23.932	0.432	1.4	123.0	O K
	120 min Winter	24.048	0.548	1.4	156.1	O K
	180 min Winter	24.105	0.605	1.4	172.3	O K
	240 min Winter	24.136	0.636	1.4	181.2	O K
	360 min Winter	24.170	0.670	1.4	190.9	O K
	480 min Winter	24.181	0.681	1.4	194.0	O K
	600 min Winter	24.179	0.679	1.4	193.4	O K
	720 min Winter	24.169	0.669	1.4	190.7	O K
	960 min Winter	24.147	0.647	1.4	184.4	O K
	1440 min Winter	24.089	0.589	1.4	167.8	O K
	2160 min Winter	23.994	0.494	1.4	140.8	O K
	2880 min Winter	23.903	0.403	1.4	115.0	O K
	4320 min Winter	23.744	0.244	1.3	69.5	O K
	5760 min Winter	23.624	0.124	1.3	35.4	O K
	7200 min Winter	23.554	0.054	1.3	15.4	O K
	8640 min Winter	23.536	0.036	0.9	10.2	O K
	10080 min Winter	23.522	0.022	0.6	6.2	O K
	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
	8640 min Summer	1.350	0.0	4592		
	10080 min Summer	1.198	0.0	5248		
	15 min Winter	127.747	0.0	34		
	30 min Winter	86.691	0.0	46		
	60 min Winter	56.129	0.0	74		
	120 min Winter	35.009	0.0	130		
	180 min Winter	26.112	0.0	188		
	240 min Winter	21.070	0.0	246		
	360 min Winter	15.587	0.0	360		
	480 min Winter	12.563	0.0	472		
	600 min Winter	10.618	0.0	578		
	720 min Winter	9.248	0.0	674		
	960 min Winter	7.430	0.0	762		
	1440 min Winter	5.446	0.0	1066		
	2160 min Winter	3.982	0.0	1516		
	2880 min Winter	3.185	0.0	1936		
	4320 min Winter	2.319	0.0	2692		
	5760 min Winter	1.852	0.0	3352		
	7200 min Winter	1.556	0.0	3880		
	8640 min Winter	1.350	0.0	4584		
	10080 min Winter	1.198	0.0	5464		
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Cascade Rainfall Details for 15104 Soakaway cascade.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.800	Shortest Storm (mins)	15
Ratio R	0.330	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.000

Time (mins)	Area
From:	To: (ha)
0	4 0.000

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<u>Cascade Model Details for 15104 Soakaway cascade.SRCX</u> Storage is Online Cover Level (m) 25.000 <u>Cellular Storage Structure</u> Invert Level (m) 23.500 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.03000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.03000 <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>300.0</td> <td>300.0</td> <td>1.200</td> <td>429.0</td> <td>355.6</td> </tr> <tr> <td>0.800</td> <td>300.0</td> <td>355.4</td> <td>1.500</td> <td>515.0</td> <td>355.7</td> </tr> <tr> <td>0.801</td> <td>300.0</td> <td>355.5</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	300.0	300.0	1.200	429.0	355.6	0.800	300.0	355.4	1.500	515.0	355.7	0.801	300.0	355.5			
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