



**Horndean Road,
Emsworth**

Drainage Strategy Report

Prepared by:

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Prepared for:

Bellway Homes

Ref: ES1711/DR/A

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Prepared by Kevin Mitchell
 I Eng FIHIE

Signed:

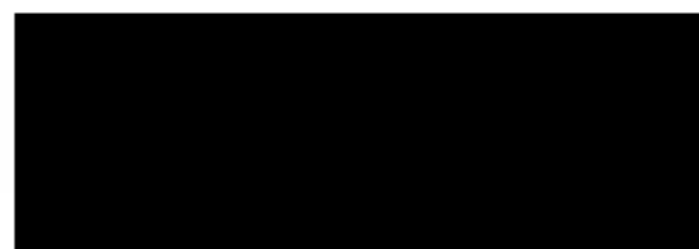


Date: 31st March 2017

Reviewed by Kazys Narbutas

 BSc (Hons) CEng
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Signed



Date: 31st March 2017

Revision	Description	Date	Initials
A	Initial issue	March 2017	KAM

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1.0 INTRODUCTION

- 1.1 The development site has the benefit of an outline planning consent reference APP/14/00547, dated 29th April 2015, granted by Havant Borough Council.
- 1.2 A Flood Risk Assessment (FRA) reference 13-016 dated April 2014, prepared by C&A Consulting Engineers Ltd., was submitted and subsequently approved as part of the outline planning consent.
- 1.3 The development proposals involve the construction of a flood storage area, diversion of a designated main river and flood mitigation works. The flood mitigation works are required to replace lost Flood Zone 3.
- 1.4 Further to the FRA an Environmental Permit reference EPRIGB3598JL-L01, dated 3rd May 2016, was granted by the Environment Agency, consenting the works associated with constructing the Wetland Area and diverting a designated Main River (West Brook).
- 1.5 This report and associated drawings and calculations detail how the drainage for the development will be delivered.

2.0 SURFACE WATER DRAINAGE

- 2.1 The surface water drainage strategy for the development has been based on the requirements of SUDS techniques with the discharge rate restricted to the Greenfield runoff rate, all as outlined in the approved FRA.
- 2.2 The approved greenfield runoff rate quoted in the FRA is 17.4 l/s.
- 2.3 The drainage strategy utilises a combination of tanked porous paving roads and underground tanks. The storage features then discharge via flow control devices into the Wetland Area at 3 separate locations at the greenfield runoff rate in aggregate.
- 2.4 There is an existing 600 diameter Southern Water surface water sewer crossing the site which discharges into the existing main river. The sewer is to be diverted to connect into the diverted main river.
- 2.5 There is an existing pond feature on the site into which an existing highway drain from Horndean Road discharges to. The pond then in turn discharges into the West Brook via a 300 diameter pipe. It is proposed to relay the 300 diameter pipe and connect into West Brook.
- 2.6 Exceedance events and local network failures have been considered and flood flow routes designed into the development proposals. These have been indicated on the drainage strategy drawings ES1711-500-05-01 to 03.

3.0 Foul Drainage

- 3.1 There is an existing Southern Water foul sewer crossing the site and the development has been designed to avoid any diversion.
- 3.2 It is proposed to connect the northern part of the development to this sewer via gravity.
- 3.3 Due to level issues it is not possible to drain the southern part of the development via gravity. It is proposed therefore to install a pump station and pump up to the existing sewer.

Appendix A

Road 1A - Drainage Calculations

Lone Barn Studios

Horndean Road

Stanbridge Lane

Fmsworth

Romsey SO51 0HE

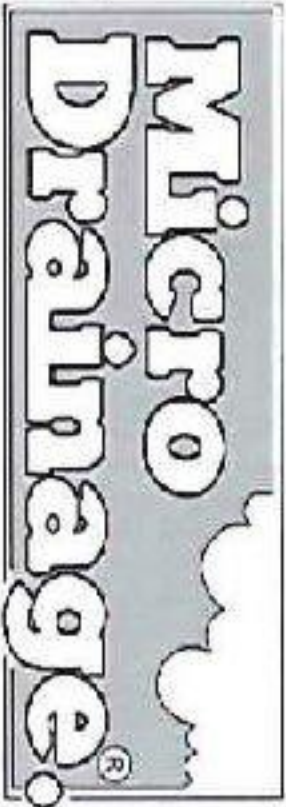
Attenuation Tank B

Dale March 2017

Designed by KAM

File Cascade.casx

Checked by KHN



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Attenuation Tank B.srxx

Upstream Structures **Outflow To** **Overflow To**

(None) Road 1A.srxx

(None)

Half Drain Time : 168 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.069	0.418	0.0	5.0	5.0	47.7	OK
30 min Summer	9.200	0.550	0.0	5.0	5.0	62.7	OK
60 min Summer	9.318	0.668	0.0	5.0	5.0	76.1	Flood Risk
120 min Summer	9.392	0.742	0.0	5.0	5.0	84.5	Flood Risk
180 min Summer	9.400	0.750	0.0	5.0	5.0	85.4	Flood Risk
240 min Summer	9.391	0.741	0.0	5.0	5.0	84.4	Flood Risk
360 min Summer	9.361	0.711	0.0	5.0	5.0	81.1	Flood Risk
480 min Summer	9.325	0.675	0.0	5.0	5.0	76.9	Flood Risk
600 min Summer	9.285	0.635	0.0	5.0	5.0	72.4	Flood Risk
720 min Summer	9.245	0.595	0.0	5.0	5.0	67.9	OK
960 min Summer	9.169	0.519	0.0	5.0	5.0	59.2	OK
1440 min Summer	9.037	0.387	0.0	5.0	5.0	44.2	OK
2160 min Summer	8.903	0.253	0.0	5.0	5.0	28.8	OK
2880 min Summer	8.842	0.192	0.0	4.8	4.8	21.9	OK
4320 min Summer	8.796	0.146	0.0	3.6	3.6	16.6	OK
5760 min Summer	8.769	0.119	0.0	3.0	3.0	13.6	OK
7200 min Summer	8.751	0.101	0.0	2.5	2.5	11.5	OK
8640 min Summer	8.738	0.088	0.0	2.2	2.2	10.0	OK
10080 min Summer	8.728	0.078	0.0	2.0	2.0	8.9	OK

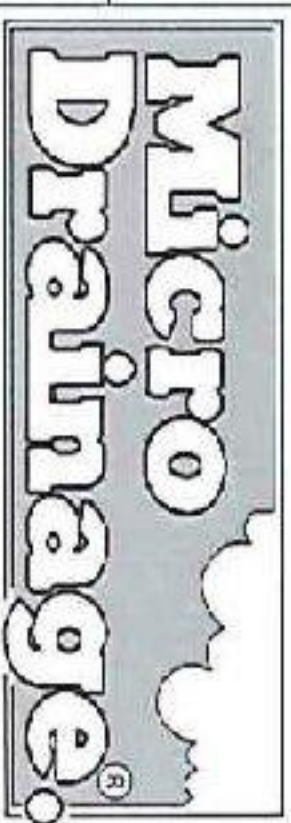
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.408	0.0	52.1	28
30 min Summer	79.579	0.0	70.1	41
60 min Summer	51.031	0.0	89.9	70
120 min Summer	31.581	0.0	111.3	126
180 min Summer	23.488	0.0	124.1	158
240 min Summer	18.897	0.0	133.2	188
360 min Summer	13.902	0.0	147.0	256
480 min Summer	11.169	0.0	157.4	324
600 min Summer	9.417	0.0	165.9	392
720 min Summer	8.187	0.0	173.1	460
960 min Summer	6.558	0.0	184.9	588
1440 min Summer	4.789	0.0	202.5	834
2160 min Summer	3.409	0.0	221.3	1172
2880 min Summer	2.783	0.0	235.4	1504
4320 min Summer	2.020	0.0	256.3	2216
5760 min Summer	1.607	0.0	271.9	2944
7200 min Summer	1.346	0.0	284.6	3680
8640 min Summer	1.165	0.0	295.7	4408
10080 min Summer	1.032	0.0	305.4	5144

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horndean Road
 Emsworth
 Attenuation Tank R

Date March 2017
 File Cascade.casx

Designed by KAM
 Checked by KHN



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Attenuation Tank R.srccx

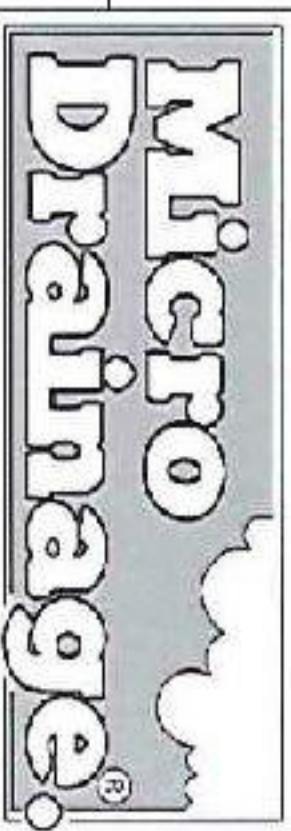
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	9.122	0.472	0.0	5.0	5.0	53.9	O K
30 min Winter	9.272	0.622	0.0	5.0	5.0	70.9	Flood Risk
60 min Winter	9.410	0.760	0.0	5.0	5.0	86.6	Flood Risk
120 min Winter	9.504	0.854	0.0	5.0	5.0	97.4	Flood Risk
180 min Winter	9.516	0.866	0.0	5.0	5.0	98.7	Flood Risk
240 min Winter	9.499	0.849	0.0	5.0	5.0	96.8	Flood Risk
360 min Winter	9.456	0.806	0.0	5.0	5.0	91.9	Flood Risk
480 min Winter	9.399	0.749	0.0	5.0	5.0	85.4	Flood Risk
600 min Winter	9.338	0.688	0.0	5.0	5.0	78.4	Flood Risk
720 min Winter	9.276	0.626	0.0	5.0	5.0	71.3	Flood Risk
960 min Winter	9.157	0.507	0.0	5.0	5.0	57.8	O K
1440 min Winter	8.963	0.313	0.0	5.0	5.0	35.7	O K
2160 min Winter	8.835	0.185	0.0	4.6	4.6	21.1	O K
2880 min Winter	8.800	0.150	0.0	3.8	3.8	17.1	O K
4320 min Winter	8.761	0.111	0.0	2.8	2.8	12.6	O K
5760 min Winter	8.738	0.088	0.0	2.2	2.2	10.1	O K
7200 min Winter	8.724	0.074	0.0	1.9	1.9	8.5	O K
8640 min Winter	8.715	0.065	0.0	1.6	1.6	7.4	O K
10080 min Winter	8.707	0.057	0.0	1.4	1.4	6.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Winter	110.408	0.0	58.4	28			
30 min Winter	79.579	0.0	78.5	41			
60 min Winter	51.031	0.0	100.7	70			
120 min Winter	31.581	0.0	124.6	124			
180 min Winter	23.488	0.0	139.0	178			
240 min Winter	18.897	0.0	149.2	202			
360 min Winter	13.902	0.0	164.6	278			
480 min Winter	11.169	0.0	176.3	354			
600 min Winter	9.417	0.0	185.8	426			
720 min Winter	8.187	0.0	193.9	496			
960 min Winter	6.558	0.0	207.1	628			
1440 min Winter	4.789	0.0	226.9	862			
2160 min Winter	3.489	0.0	247.9	1156			
2880 min Winter	2.783	0.0	263.6	1508			
4320 min Winter	2.020	0.0	287.1	2240			
5760 min Winter	1.607	0.0	304.6	2952			
7200 min Winter	1.346	0.0	318.8	3680			
8640 min Winter	1.165	0.0	331.2	4408			
10080 min Winter	1.032	0.0	342.0	5072			

Lone Barn Studios
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Horndean Road
 Emsworth
 Attenuation Tank B

Date March 2017
 File Cascade.casx

Designed by K2M
 Checked by KHN



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Attenuation Tank B.srccx

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)		19.400	Shortest Storm (mins)		15
Ratio R		0.350	Longest Storm (mins)		10080
Summer Storms		Yes	Climate Change %		+30

Time Area Diagram

Total Area (ha) 0.235

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 5	0.000	5 10	0.118	10 15	0.117

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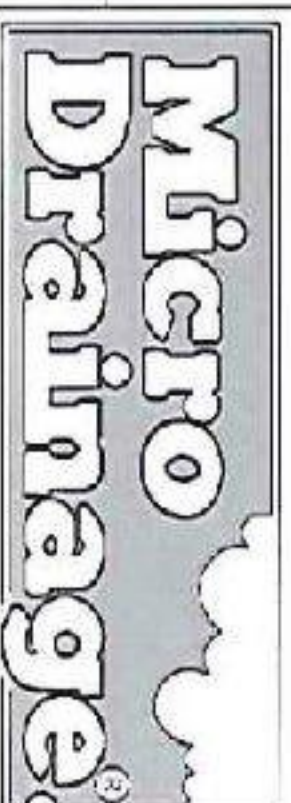
Attenuation Tank B

Date March 2017

Designed by KAM

File Cascade.casx

Checked by KHN



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Attenuation Tank B.srcx

Storage is Online Cover Level (m) 9.550

Cellular Storage Structure

Invert Level (m) 8.650 Safety Factor 5.0

Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95

Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	120.0	0.0	0.900	120.0	0.0

Depth/Flow Relationship Outflow Control

Invert Level (m) 8.650

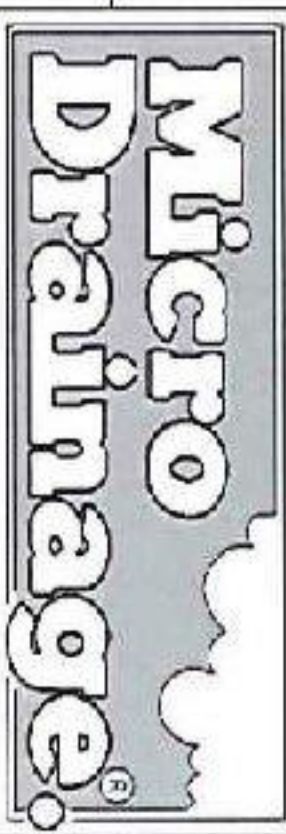
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	5.0000	1.800	5.0000	3.400	5.0000	5.000	5.0000
0.400	5.0000	2.000	5.0000	3.600	5.0000	5.200	5.0000
0.600	5.0000	2.200	5.0000	3.800	5.0000	5.400	5.0000
0.800	5.0000	2.400	5.0000	4.000	5.0000	5.600	5.0000
1.000	5.0000	2.600	5.0000	4.200	5.0000	5.800	5.0000
1.200	5.0000	2.800	5.0000	4.400	5.0000	6.000	5.0000
1.400	5.0000	3.000	5.0000	4.600	5.0000		
1.600	5.0000	3.200	5.0000	4.800	5.0000		

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Horndean Road
 Emsworth
 Attenuation Tank A

Date March 2017
 File Cascade.casx

Designed by KAM
 Checked by KHN



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Attenuation Tank A.srcx

Upstream Outflow To Overflow To
 Structures

(None) Road 1A.srcx (None)

Half Drain Time : 147 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	10.080	0.430	0.0	5.0	5.0	40.8	O K
30 min Summer	10.213	0.563	0.0	5.0	5.0	53.5	O K
60 min Summer	10.327	0.677	0.0	5.0	5.0	64.4	Flood Risk
120 min Summer	10.386	0.738	0.0	5.0	5.0	70.1	Flood Risk
180 min Summer	10.391	0.741	0.0	5.0	5.0	70.4	Flood Risk
240 min Summer	10.377	0.727	0.0	5.0	5.0	69.0	Flood Risk
360 min Summer	10.337	0.687	0.0	5.0	5.0	65.2	Flood Risk
480 min Summer	10.291	0.641	0.0	5.0	5.0	60.9	Flood Risk
600 min Summer	10.244	0.594	0.0	5.0	5.0	56.4	O K
720 min Summer	10.198	0.548	0.0	5.0	5.0	52.0	O K
960 min Summer	10.112	0.462	0.0	5.0	5.0	43.9	O K
1440 min Summer	9.975	0.325	0.0	5.0	5.0	30.9	O K
2160 min Summer	9.857	0.207	0.0	5.0	5.0	19.7	O K
2880 min Summer	9.820	0.170	0.0	4.3	4.3	16.2	O K
4320 min Summer	9.779	0.129	0.0	3.2	3.2	12.2	O K
5760 min Summer	9.755	0.105	0.0	2.6	2.6	9.9	O K
7200 min Summer	9.738	0.088	0.0	2.2	2.2	8.4	O K
8640 min Summer	9.727	0.077	0.0	1.9	1.9	7.3	O K
10080 min Summer	9.718	0.068	0.0	1.7	1.7	6.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.408	0.0	45.2	27
30 min Summer	79.579	0.0	60.8	41
60 min Summer	51.031	0.0	78.0	68
120 min Summer	31.581	0.0	96.6	118
180 min Summer	23.488	0.0	107.8	148
240 min Summer	18.897	0.0	115.6	180
360 min Summer	13.902	0.0	127.6	250
480 min Summer	11.169	0.0	136.7	318
600 min Summer	9.417	0.0	144.0	384
720 min Summer	8.187	0.0	150.3	450
960 min Summer	6.558	0.0	160.5	576
1440 min Summer	4.789	0.0	175.8	814
2160 min Summer	3.489	0.0	192.1	1136
2880 min Summer	2.783	0.0	204.3	1484
4320 min Summer	2.020	0.0	222.5	2212
5760 min Summer	1.607	0.0	236.1	2944
7200 min Summer	1.346	0.0	247.1	3680
8640 min Summer	1.165	0.0	256.7	4408
10080 min Summer	1.032	0.0	265.1	5144

Ione Barn Studios

Horndean Road

Stanbridge Lane

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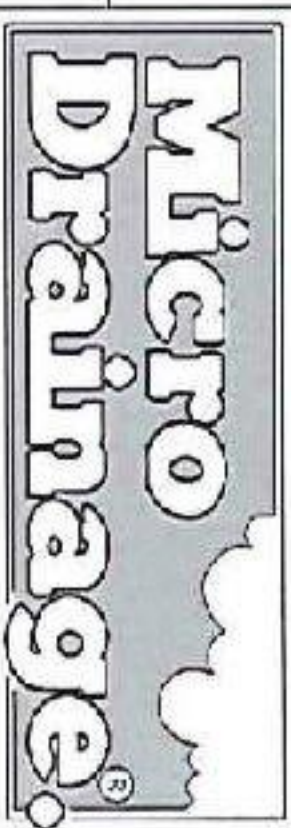
Attenuation Tank A

Date March 2017

Designed by KAM

File Cascade.casx

Checked by KHN



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Attenuation Tank A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	10.136	0.486	0.0	5.0	5.0	46.1	0 K
30 min Winter	10.288	0.638	0.0	5.0	5.0	60.6	Flood Risk
60 min Winter	10.423	0.773	0.0	5.0	5.0	73.4	Flood Risk
120 min Winter	10.504	0.854	0.0	5.0	5.0	81.1	Flood Risk
180 min Winter	10.501	0.851	0.0	5.0	5.0	80.8	Flood Risk
240 min Winter	10.480	0.830	0.0	5.0	5.0	78.8	Flood Risk
360 min Winter	10.419	0.769	0.0	5.0	5.0	73.1	Flood Risk
480 min Winter	10.348	0.698	0.0	5.0	5.0	66.3	Flood Risk
600 min Winter	10.274	0.624	0.0	5.0	5.0	59.3	Flood Risk
720 min Winter	10.202	0.552	0.0	5.0	5.0	52.5	0 K
960 min Winter	10.071	0.421	0.0	5.0	5.0	40.0	0 K
1440 min Winter	9.884	0.234	0.0	5.0	5.0	22.3	0 K
2160 min Winter	9.813	0.163	0.0	4.1	4.1	15.4	0 K
2880 min Winter	9.781	0.131	0.0	3.3	3.3	12.5	0 K
4320 min Winter	9.746	0.096	0.0	2.4	2.4	9.2	0 K
5760 min Winter	9.727	0.077	0.0	1.9	1.9	7.3	0 K
7200 min Winter	9.715	0.065	0.0	1.6	1.6	6.1	0 K
8640 min Winter	9.706	0.056	0.0	1.4	1.4	5.3	0 K
10080 min Winter	9.700	0.050	0.0	1.2	1.2	4.7	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	118.408	0.0	50.7	28
30 min Winter	79.579	0.0	68.1	41
60 min Winter	51.031	0.0	87.4	68
120 min Winter	31.581	0.0	108.2	124
180 min Winter	23.488	0.0	120.7	162
240 min Winter	18.897	0.0	129.5	194
360 min Winter	13.902	0.0	142.9	272
480 min Winter	11.169	0.0	153.1	344
600 min Winter	9.417	0.0	161.3	414
720 min Winter	8.187	0.0	168.3	482
960 min Winter	6.558	0.0	179.8	608
1440 min Winter	4.789	0.0	196.9	818
2160 min Winter	3.489	0.0	215.2	1140
2880 min Winter	2.783	0.0	228.9	1508
4320 min Winter	2.020	0.0	249.2	2216
5760 min Winter	1.607	0.0	264.4	2944
7200 min Winter	1.346	0.0	276.7	3672
8640 min Winter	1.165	0.0	287.5	4392
10080 min Winter	1.032	0.0	296.9	5120

Tone Barn Studios

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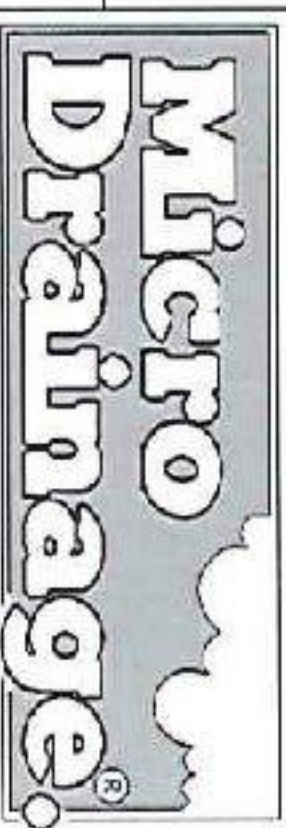
Attenuation Tank A

Date March 2017

Designed by KAM

File Cascade.casx

Checked by KHN



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Attenuation Tank A.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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.204

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 5	0.000	5 10	0.102	10 15	0.102

Lone Barn Studios

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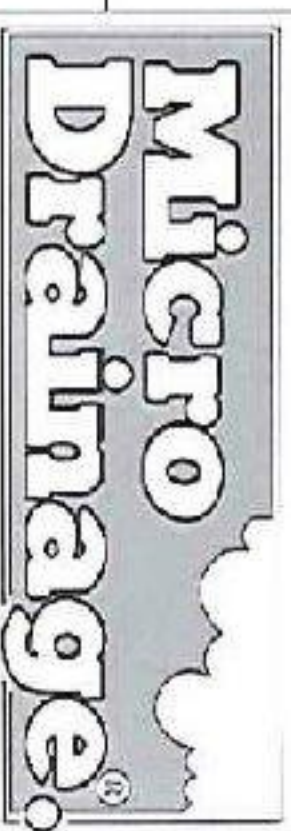
Attenuation Tank A

Date March 2017

Designed by KAM

File Cascade.casx

Checked by KHN



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Attenuation Tank A.srcx

Storage is Online Cover Level (m) 10.550

Cellular Storage Structure

Invert Level (m) 9.650 Safety Factor 5.0

Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95

Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	100.0	0.0	0.600	100.0	0.0

Depth/Flow Relationship Outflow Control

Invert Level (m) 9.650

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	5.0000	1.800	5.0000	3.400	5.0000	5.000	5.0000
0.400	5.0000	2.000	5.0000	3.600	5.0000	5.200	5.0000
0.600	5.0000	2.200	5.0000	3.800	5.0000	5.400	5.0000
0.800	5.0000	2.400	5.0000	4.000	5.0000	5.600	5.0000
1.000	5.0000	2.600	5.0000	4.200	5.0000	5.800	5.0000
1.200	5.0000	2.800	5.0000	4.400	5.0000	6.000	5.0000
1.400	5.0000	3.000	5.0000	4.600	5.0000		
1.600	5.0000	3.200	5.0000	4.800	5.0000		

Lone Barn Studios

Nordean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

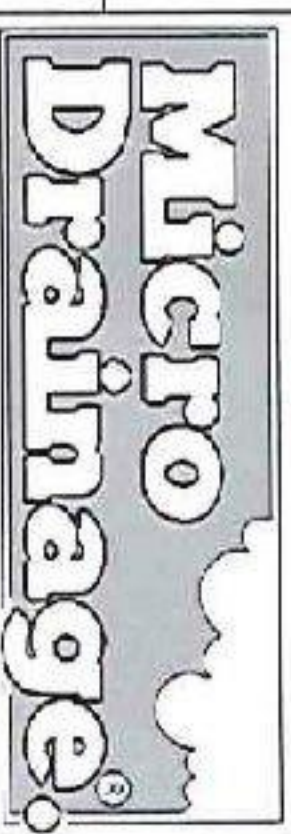
Attenuation Tank C

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Attenuation Tank C.srccx

Upstream Outflow To Overflow To
Structures

(None) Road 1A.srccx (None)

Half Drain Time : 94 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E (l/s)	Max Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	9.092	0.392	0.0	5.0	5.0	5.0	29.0	O K
30 min Summer	9.208	0.508	0.0	5.0	5.0	5.0	37.7	O K
60 min Summer	9.297	0.597	0.0	5.0	5.0	5.0	44.3	O K
120 min Summer	9.332	0.632	0.0	5.0	5.0	5.0	46.8	Flood Risk
180 min Summer	9.323	0.623	0.0	5.0	5.0	5.0	46.2	Flood Risk
240 min Summer	9.299	0.599	0.0	5.0	5.0	5.0	44.4	O K
360 min Summer	9.243	0.543	0.0	5.0	5.0	5.0	40.3	O K
480 min Summer	9.187	0.487	0.0	5.0	5.0	5.0	36.1	O K
600 min Summer	9.133	0.433	0.0	5.0	5.0	5.0	32.1	O K
720 min Summer	9.084	0.384	0.0	5.0	5.0	5.0	28.4	O K
960 min Summer	9.002	0.302	0.0	5.0	5.0	5.0	22.4	O K
1440 min Summer	8.903	0.203	0.0	5.0	5.0	5.0	15.0	O K
2160 min Summer	8.856	0.156	0.0	3.9	3.9	3.9	11.6	O K
2880 min Summer	8.829	0.129	0.0	3.2	3.2	3.2	9.5	O K
4320 min Summer	8.796	0.096	0.0	2.4	2.4	2.4	7.1	O K
5760 min Summer	8.778	0.078	0.0	1.9	1.9	1.9	5.8	O K
7200 min Summer	8.765	0.065	0.0	1.6	1.6	1.6	4.9	O K
8640 min Summer	8.757	0.057	0.0	1.4	1.4	1.4	4.2	O K
10080 min Summer	8.750	0.050	0.0	1.3	1.3	1.3	3.7	O K

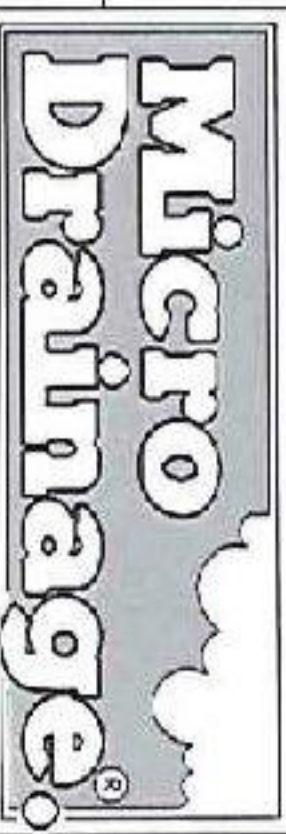
Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	118.408	0.0	33.3	27
30 min Summer	79.579	0.0	44.7	40
60 min Summer	51.031	0.0	57.4	66
120 min Summer	31.581	0.0	71.0	102
180 min Summer	23.488	0.0	79.2	136
240 min Summer	18.897	0.0	85.0	170
360 min Summer	13.902	0.0	93.8	238
480 min Summer	11.169	0.0	100.5	304
600 min Summer	9.417	0.0	105.9	368
720 min Summer	8.187	0.0	110.5	428
960 min Summer	6.558	0.0	118.0	546
1440 min Summer	4.789	0.0	129.3	762
2160 min Summer	3.489	0.0	141.3	1124
2880 min Summer	2.783	0.0	150.3	1480
4320 min Summer	2.020	0.0	163.6	2212
5760 min Summer	1.607	0.0	173.6	2944
7200 min Summer	1.346	0.0	181.7	3672
8640 min Summer	1.165	0.0	188.7	4408
10080 min Summer	1.032	0.0	194.9	5144

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Hordean Road
 Emsworth
 Attenuation Tank C

Date March 2017
 File Cascade.casx

Designed by KAM
 Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Attenuation Tank C.srxx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max S Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	9.144	0.444	0.0	5.0	5.0	32.9	O K
30 min Winter	9.278	0.578	0.0	5.0	5.0	42.8	O K
60 min Winter	9.385	0.685	0.0	5.0	5.0	50.7	Flood Risk
120 min Winter	9.423	0.723	0.0	5.0	5.0	53.6	Flood Risk
180 min Winter	9.407	0.707	0.0	5.0	5.0	52.4	Flood Risk
240 min Winter	9.370	0.670	0.0	5.0	5.0	49.6	Flood Risk
360 min Winter	9.282	0.582	0.0	5.0	5.0	43.1	O K
480 min Winter	9.193	0.493	0.0	5.0	5.0	36.5	O K
600 min Winter	9.110	0.410	0.0	5.0	5.0	30.4	O K
720 min Winter	9.036	0.336	0.0	5.0	5.0	24.9	O K
960 min Winter	8.928	0.228	0.0	5.0	5.0	16.9	O K
1440 min Winter	8.863	0.163	0.0	4.1	4.1	12.0	O K
2160 min Winter	8.821	0.121	0.0	3.0	3.0	9.0	O K
2880 min Winter	8.797	0.097	0.0	2.4	2.4	7.2	O K
4320 min Winter	8.771	0.071	0.0	1.8	1.8	5.3	O K
5760 min Winter	8.757	0.057	0.0	1.4	1.4	4.2	O K
7200 min Winter	8.748	0.048	0.0	1.2	1.2	3.5	O K
8640 min Winter	8.741	0.041	0.0	1.0	1.0	3.0	O K
10080 min Winter	8.737	0.037	0.0	0.9	0.9	2.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Winter	118.408	0.0	37.3	27			
30 min Winter	79.579	0.0	50.1	40			
60 min Winter	51.031	0.0	64.3	66			
120 min Winter	31.581	0.0	79.5	112			
180 min Winter	23.488	0.0	88.7	146			
240 min Winter	18.897	0.0	95.2	184			
360 min Winter	13.902	0.0	105.1	256			
480 min Winter	11.169	0.0	112.5	326			
600 min Winter	9.417	0.0	118.6	388			
720 min Winter	8.187	0.0	123.8	448			
960 min Winter	6.558	0.0	132.2	550			
1440 min Winter	4.789	0.0	144.8	772			
2160 min Winter	3.489	0.0	158.2	1132			
2880 min Winter	2.783	0.0	168.3	1484			
4320 min Winter	2.020	0.0	183.2	2212			
5760 min Winter	1.607	0.0	194.4	2944			
7200 min Winter	1.346	0.0	203.5	3640			
8640 min Winter	1.165	0.0	211.4	4400			
10080 min Winter	1.032	0.0	218.3	5128			

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey S051 0HE

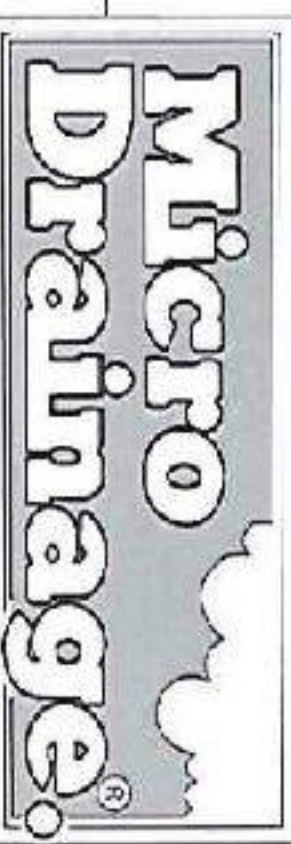
Attenuation Tank C

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Attenuation Tank C.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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.150

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: To:		From: To:		From: To:	
0 5	0.000	5 10	0.075	10 15	0.075

Lone Barn Studios

Horndean Road

Standridge Lane

Emsworth

Romsey SO51 0HE

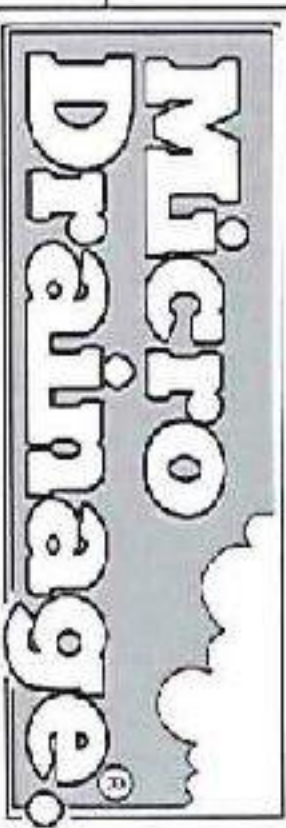
Attenuation Tank C

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Attenuation Tank C.srcx

Storage is Online Cover Level (m) 9.600

Cellular Storage Structure

Invert Level (m) 8.700 Safety Factor 5.0

Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95

Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	78.0	0.0	0.900	78.0	0.0
0.600	78.0	0.0			

Depth/Flow Relationship Outflow Control

Invert Level (m) 8.700

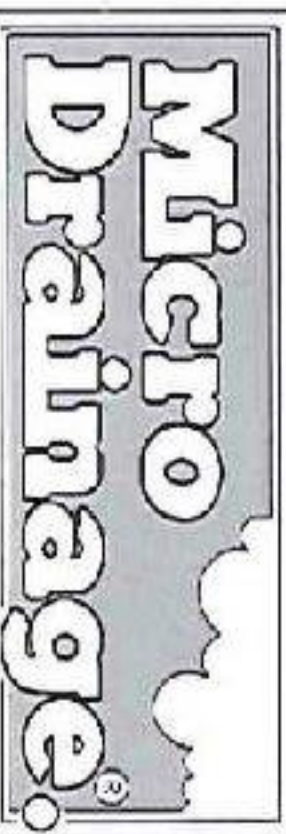
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	5.0000	1.800	5.0000	3.400	5.0000	5.000	5.0000
0.400	5.0000	2.000	5.0000	3.600	5.0000	5.200	5.0000
0.600	5.0000	2.200	5.0000	3.800	5.0000	5.400	5.0000
0.800	5.0000	2.400	5.0000	4.000	5.0000	5.600	5.0000
1.000	5.0000	2.600	5.0000	4.200	5.0000	5.800	5.0000
1.200	5.0000	2.800	5.0000	4.400	5.0000	6.000	5.0000
1.400	5.0000	3.000	5.0000	4.600	5.0000		
1.600	5.0000	3.200	5.0000	4.800	5.0000		

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horneadean Road
 Emsworth
 Plot 114 Drive

Date March 2017
 File Cascade.casx

Designed by KAM
 Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Plot 114.srxx

Upstream Outflow To Overflow To
 Structures

(None) Road 1A.srxx

(None)

Half Drain Time : 24 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	10.500	0.200	0.0	1.4	1.4	1.4	2.2 Flood Risk
30 min Summer	10.539	0.239	0.0	1.4	1.4	1.4	2.7 Flood Risk
60 min Summer	10.559	0.259	0.0	1.4	1.4	1.4	2.9 Flood Risk
120 min Summer	10.544	0.244	0.0	1.4	1.4	1.4	2.8 Flood Risk
180 min Summer	10.515	0.215	0.0	1.4	1.4	1.4	2.4 Flood Risk
240 min Summer	10.492	0.192	0.0	1.3	1.3	1.3	2.2 Flood Risk
360 min Summer	10.462	0.162	0.0	1.1	1.1	1.1	1.8 Flood Risk
480 min Summer	10.441	0.141	0.0	1.0	1.0	1.0	1.6 Flood Risk
600 min Summer	10.425	0.125	0.0	0.9	0.9	0.9	1.4 Flood Risk
720 min Summer	10.413	0.113	0.0	0.8	0.8	0.8	1.2 Flood Risk
960 min Summer	10.395	0.095	0.0	0.7	0.7	0.7	1.0 Flood Risk
1440 min Summer	10.373	0.073	0.0	0.5	0.5	0.5	0.8 Flood Risk
2160 min Summer	10.355	0.055	0.0	0.4	0.4	0.4	0.6 Flood Risk
2880 min Summer	10.344	0.044	0.0	0.3	0.3	0.3	0.4 Flood Risk
4320 min Summer	10.333	0.033	0.0	0.2	0.2	0.2	0.3 Flood Risk
5760 min Summer	10.326	0.026	0.0	0.2	0.2	0.2	0.2 Flood Risk
7200 min Summer	10.322	0.022	0.0	0.2	0.2	0.2	0.2 Flood Risk
8640 min Summer	10.319	0.019	0.0	0.1	0.1	0.1	0.1 Flood Risk
10080 min Summer	10.317	0.017	0.0	0.1	0.1	0.1	0.1 Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.408	0.0	2.9	20
30 min Summer	79.579	0.0	4.0	30
60 min Summer	51.031	0.0	5.2	46
120 min Summer	31.581	0.0	6.4	80
180 min Summer	23.488	0.0	7.2	112
240 min Summer	18.897	0.0	7.7	142
360 min Summer	13.902	0.0	8.5	202
480 min Summer	11.169	0.0	9.1	264
600 min Summer	9.417	0.0	9.6	324
720 min Summer	8.187	0.0	10.1	384
960 min Summer	6.558	0.0	10.7	506
1440 min Summer	4.789	0.0	11.8	744
2160 min Summer	3.489	0.0	12.8	1108
2880 min Summer	2.783	0.0	13.6	1476
4320 min Summer	2.020	0.0	14.7	2204
5760 min Summer	1.607	0.0	15.5	2928
7200 min Summer	1.346	0.0	16.2	3672
8640 min Summer	1.165	0.0	16.7	4400
10080 min Summer	1.032	0.0	17.2	5120

Lone Barn Studios

Horndean Road

Stanbridge Lane

Fmsworth

Romsey SO51 0HE

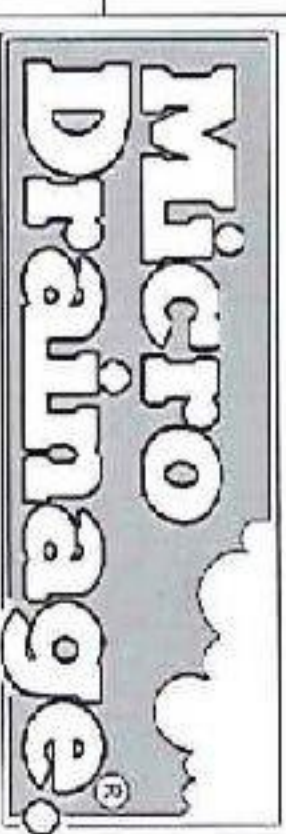
Plot 114 Drive

Date March 2017

Designed by KAM

File Cascade.casx

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Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Plot 114.srpx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	10.527	0.227	0.0	1.4	1.4	2.6	Flood Risk
30 min Winter	10.571	0.271	0.0	1.4	1.4	3.1	Flood Risk
60 min Winter	10.586	0.286	0.0	1.4	1.4	3.2	Flood Risk
120 min Winter	10.550	0.250	0.0	1.4	1.4	2.8	Flood Risk
180 min Winter	10.506	0.206	0.0	1.4	1.4	2.3	Flood Risk
240 min Winter	10.479	0.179	0.0	1.3	1.3	2.0	Flood Risk
360 min Winter	10.444	0.144	0.0	1.0	1.0	1.6	Flood Risk
480 min Winter	10.420	0.120	0.0	0.8	0.8	1.3	Flood Risk
600 min Winter	10.404	0.104	0.0	0.7	0.7	1.1	Flood Risk
720 min Winter	10.392	0.092	0.0	0.6	0.6	1.0	Flood Risk
960 min Winter	10.375	0.075	0.0	0.5	0.5	0.8	Flood Risk
1440 min Winter	10.355	0.055	0.0	0.4	0.4	0.6	Flood Risk
2160 min Winter	10.341	0.041	0.0	0.3	0.3	0.4	Flood Risk
2880 min Winter	10.333	0.033	0.0	0.2	0.2	0.3	Flood Risk
4320 min Winter	10.324	0.024	0.0	0.2	0.2	0.2	Flood Risk
5760 min Winter	10.319	0.019	0.0	0.1	0.1	0.1	Flood Risk
7200 min Winter	10.316	0.016	0.0	0.1	0.1	0.1	Flood Risk
8640 min Winter	10.314	0.014	0.0	0.1	0.1	0.1	Flood Risk
10080 min Winter	10.312	0.012	0.0	0.1	0.1	0.1	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Winter	118.408	0.0	3.3	21			
30 min Winter	79.579	0.0	4.5	31			
60 min Winter	51.031	0.0	5.8	50			
120 min Winter	31.581	0.0	7.2	86			
180 min Winter	23.488	0.0	8.1	116			
240 min Winter	18.897	0.0	8.7	146			
360 min Winter	13.902	0.0	9.6	208			
480 min Winter	11.169	0.0	10.3	270			
600 min Winter	9.417	0.0	10.8	330			
720 min Winter	8.187	0.0	11.3	390			
960 min Winter	6.558	0.0	12.1	510			
1440 min Winter	4.789	0.0	13.2	756			
2160 min Winter	3.489	0.0	14.4	1108			
2880 min Winter	2.783	0.0	15.3	1464			
4320 min Winter	2.020	0.0	16.6	2176			
5760 min Winter	1.607	0.0	17.5	2936			
7200 min Winter	1.346	0.0	18.2	3576			
8640 min Winter	1.165	0.0	18.8	4344			
10080 min Winter	1.032	0.0	19.4	4976			

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HF

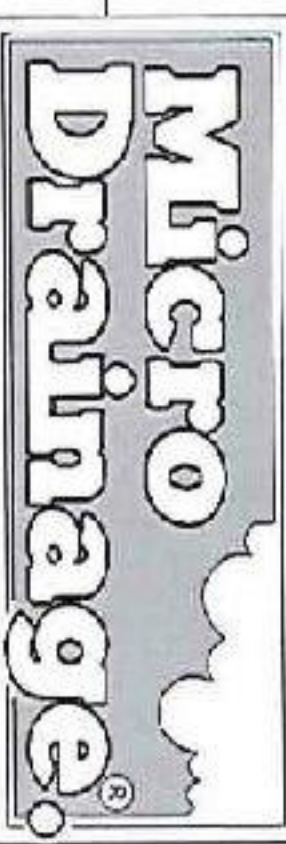
Plot 114 Drive

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Plot 114.srnx

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.014

Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: To:	From: To:	From: To:	From: To:
0	5 0.000	5	10 0.014

Lone Barn Studios

Nordean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

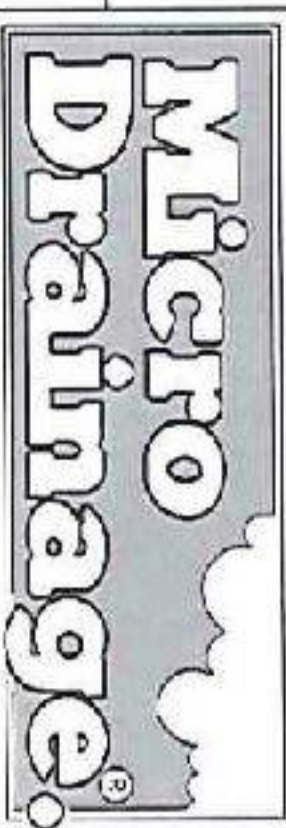
Plot 114 Drive

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Plot 114.srxx

Storage is Online Cover Level (m) 10.600

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.9
Max Percolation (l/s)	10.8	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.300	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 10.300

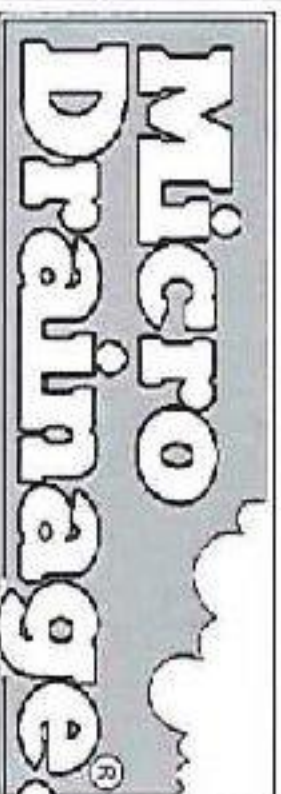
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	1.4000	1.800	1.4000	3.400	1.4000	5.000	1.4000
0.400	1.4000	2.000	1.4000	3.600	1.4000	5.200	1.4000
0.600	1.4000	2.200	1.4000	3.800	1.4000	5.400	1.4000
0.800	1.4000	2.400	1.4000	4.000	1.4000	5.600	1.4000
1.000	1.4000	2.600	1.4000	4.200	1.4000	5.800	1.4000
1.200	1.4000	2.800	1.4000	4.400	1.4000	6.000	1.4000
1.400	1.4000	3.000	1.4000	4.600	1.4000		
1.600	1.4000	3.200	1.4000	4.800	1.4000		

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HR

Horndean Road
 Emsworth
 Plot 115 Drive

Date March 2017
 File Cascade.casx

Designed by KAM
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Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Plot 115.srcx

Upstream Outflow To Overflow To
Structures

(None) Road 1A.srcx (None)

Half Drain Time : 20 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	10.474	0.224	0.0	1.4	1.4	2.0	Flood Risk
30 min Summer	10.518	0.268	0.0	1.4	1.4	2.4	Flood Risk
60 min Summer	10.534	0.284	0.0	1.4	1.4	2.6	Flood Risk
120 min Summer	10.508	0.258	0.0	1.4	1.4	2.4	Flood Risk
180 min Summer	10.471	0.221	0.0	1.4	1.4	2.0	Flood Risk
240 min Summer	10.443	0.193	0.0	1.4	1.4	1.8	Flood Risk
360 min Summer	10.411	0.161	0.0	1.1	1.1	1.5	Flood Risk
480 min Summer	10.388	0.138	0.0	1.0	1.0	1.2	Flood Risk
600 min Summer	10.372	0.122	0.0	0.9	0.9	1.1	Flood Risk
720 min Summer	10.359	0.109	0.0	0.8	0.8	1.0	Flood Risk
960 min Summer	10.341	0.091	0.0	0.6	0.6	0.8	O K
1440 min Summer	10.319	0.069	0.0	0.5	0.5	0.6	O K
2160 min Summer	10.302	0.052	0.0	0.4	0.4	0.4	O K
2880 min Summer	10.292	0.042	0.0	0.3	0.3	0.4	O K
4320 min Summer	10.280	0.030	0.0	0.2	0.2	0.2	O K
5760 min Summer	10.274	0.024	0.0	0.2	0.2	0.2	O K
7200 min Summer	10.270	0.020	0.0	0.1	0.1	0.2	O K
8640 min Summer	10.268	0.018	0.0	0.1	0.1	0.1	O K
10080 min Summer	10.266	0.016	0.0	0.1	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	118.408	0.0	2.7	20
30 min Summer	79.579	0.0	3.7	29
60 min Summer	51.031	0.0	4.8	46
120 min Summer	31.581	0.0	6.0	80
180 min Summer	23.488	0.0	6.7	110
240 min Summer	18.897	0.0	7.2	140
360 min Summer	13.902	0.0	8.0	200
480 min Summer	11.169	0.0	8.5	260
600 min Summer	9.417	0.0	9.0	322
720 min Summer	8.187	0.0	9.4	382
960 min Summer	6.558	0.0	10.0	500
1440 min Summer	4.789	0.0	11.0	742
2160 min Summer	3.489	0.0	12.0	1108
2880 min Summer	2.783	0.0	12.7	1472
4320 min Summer	2.020	0.0	13.8	2208
5760 min Summer	1.607	0.0	14.5	2888
7200 min Summer	1.346	0.0	15.1	3672
8640 min Summer	1.165	0.0	15.7	4384
10080 min Summer	1.032	0.0	16.1	5008

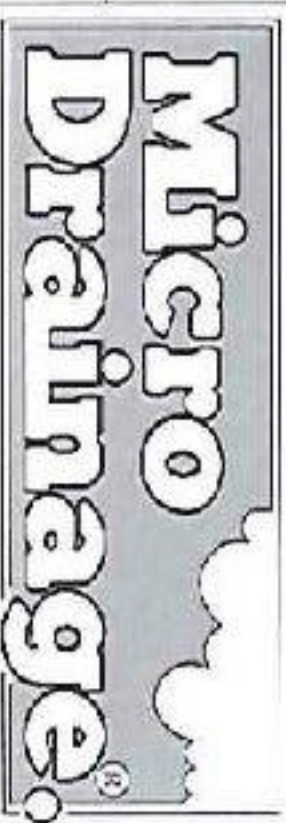
Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horndean Road

Emsworth
 Plot 115 Drive

Date March 2017
 File Cascade.casx

Designed by KAM
 Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Plot 115.srxx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	10.505	0.255	0.0	1.4	1.4	2.3 Flood Risk	
30 min Winter	10.553	0.303	0.0	1.4	1.4	2.8 Flood Risk	
60 min Winter	10.562	0.312	0.0	1.4	1.4	2.9 Flood Risk	
120 min Winter	10.509	0.259	0.0	1.4	1.4	2.4 Flood Risk	
180 min Winter	10.454	0.204	0.0	1.4	1.4	1.9 Flood Risk	
240 min Winter	10.425	0.175	0.0	1.2	1.2	1.6 Flood Risk	
360 min Winter	10.388	0.138	0.0	1.0	1.0	1.2 Flood Risk	
480 min Winter	10.365	0.115	0.0	0.8	0.8	1.0 Flood Risk	
600 min Winter	10.348	0.098	0.0	0.7	0.7	0.9 Flood Risk	
720 min Winter	10.337	0.087	0.0	0.6	0.6	0.8 Flood Risk	
960 min Winter	10.320	0.070	0.0	0.5	0.5	0.6 Flood Risk	
1440 min Winter	10.302	0.052	0.0	0.4	0.4	0.4 Flood Risk	
2160 min Winter	10.288	0.038	0.0	0.3	0.3	0.3 Flood Risk	
2880 min Winter	10.280	0.030	0.0	0.2	0.2	0.2 Flood Risk	
4320 min Winter	10.272	0.022	0.0	0.2	0.2	0.2 Flood Risk	
5760 min Winter	10.268	0.018	0.0	0.1	0.1	0.1 Flood Risk	
7200 min Winter	10.265	0.015	0.0	0.1	0.1	0.1 Flood Risk	
8640 min Winter	10.263	0.013	0.0	0.1	0.1	0.1 Flood Risk	
10080 min Winter	10.261	0.011	0.0	0.1	0.1	0.1 Flood Risk	

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	118.408	0.0	3.1	21
30 min Winter	79.579	0.0	4.2	31
60 min Winter	51.031	0.0	5.4	50
120 min Winter	31.581	0.0	6.7	84
180 min Winter	23.488	0.0	7.5	112
240 min Winter	18.897	0.0	8.1	144
360 min Winter	13.902	0.0	8.9	204
480 min Winter	11.169	0.0	9.6	266
600 min Winter	9.417	0.0	10.1	326
720 min Winter	8.187	0.0	10.5	386
960 min Winter	6.558	0.0	11.2	506
1440 min Winter	4.789	0.0	12.3	744
2160 min Winter	3.489	0.0	13.4	1112
2880 min Winter	2.783	0.0	14.2	1472
4320 min Winter	2.020	0.0	15.5	2212
5760 min Winter	1.607	0.0	16.3	2936
7200 min Winter	1.346	0.0	17.0	3584
8640 min Winter	1.165	0.0	17.6	4328
10080 min Winter	1.032	0.0	18.1	5112

Lone Barn Studios

Hordean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

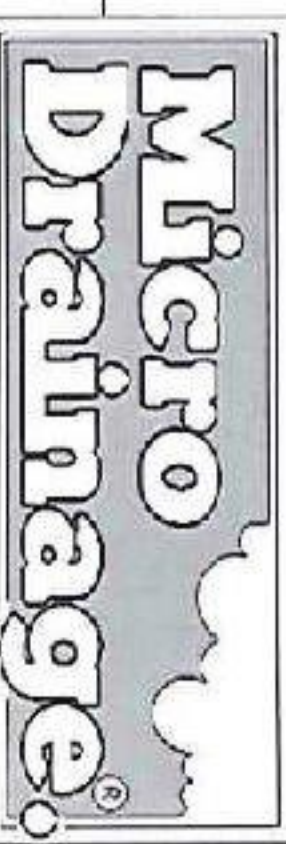
Plot 115 Drive

Date March 2017

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File Cascade.casx

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Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Plot 115.srxx

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.013

Time (mins)	Area (ha)	Time (mins)	Area (ha)		
From:	To:	From:	To:		
0	5	0.000	5	10	0.013

Lone Barn Studios

Horndean Road

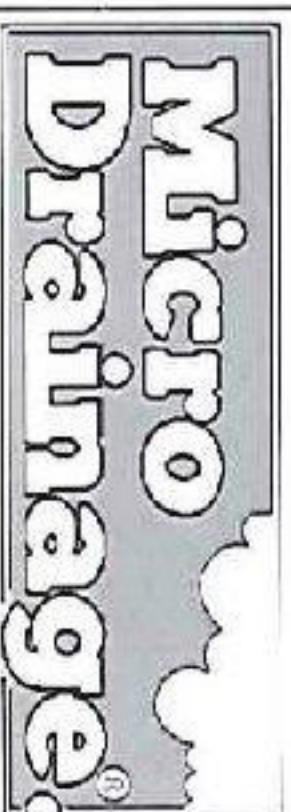
Stanbridge Lane
Romsey SO51 0HFEmsworth
Plot 115 Drive

Date March 2017

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Cascade Model Details for Plot 115.srcx

Storage is Online Cover Level (m) 10.650

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.4
Membrane Percolation (mm/hr)	1000	Length (m)	7.0
Max Percolation (l/s)	8.6	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.250	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 10.250

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	1.4000	1.800	1.4000	3.400	1.4000	5.000	1.4000
0.400	1.4000	2.000	1.4000	3.600	1.4000	5.200	1.4000
0.600	1.4000	2.200	1.4000	3.800	1.4000	5.400	1.4000
0.800	1.4000	2.400	1.4000	4.000	1.4000	5.600	1.4000
1.000	1.4000	2.600	1.4000	4.200	1.4000	5.800	1.4000
1.200	1.4000	2.800	1.4000	4.400	1.4000	6.000	1.4000
1.400	1.4000	3.000	1.4000	4.600	1.4000		
1.600	1.4000	3.200	1.4000	4.800	1.4000		

Lone Barn Studios

Hordean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

Plot 116 Drive

Date March 2017

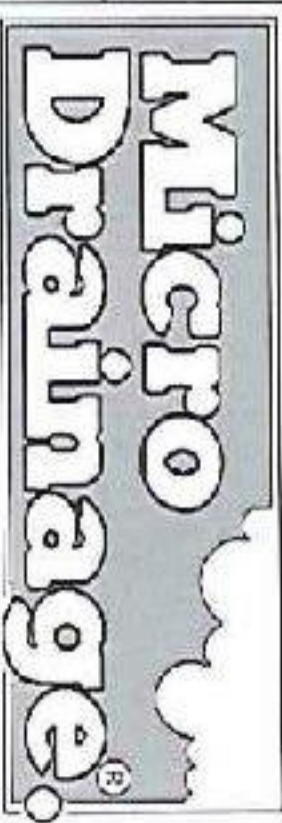
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Micro Drainage

Source Control 2013.1.1



Cascade Summary of Results for Plot 116.srcx

Upstream Outflow To Overflow To
structures

(None) Road 1A.srcx (None)

Half Drain Time : 15 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	10.745	0.195	0.0	1.4	1.4	1.4	1.3 Flood Risk
30 min Summer	10.776	0.226	0.0	1.4	1.4	1.4	1.5 Flood Risk
60 min Summer	10.777	0.227	0.0	1.4	1.4	1.4	1.5 Flood Risk
120 min Summer	10.744	0.194	0.0	1.4	1.4	1.4	1.3 Flood Risk
180 min Summer	10.718	0.168	0.0	1.2	1.2	1.2	1.1 Flood Risk
240 min Summer	10.697	0.147	0.0	1.0	1.0	1.0	1.0 Flood Risk
360 min Summer	10.670	0.120	0.0	0.8	0.8	0.8	0.8 Flood Risk
480 min Summer	10.651	0.101	0.0	0.7	0.7	0.7	0.7 Flood Risk
600 min Summer	10.638	0.088	0.0	0.6	0.6	0.6	0.6 Flood Risk
720 min Summer	10.629	0.079	0.0	0.6	0.6	0.6	0.5 Flood Risk
960 min Summer	10.615	0.065	0.0	0.5	0.5	0.5	0.4 Flood Risk
1440 min Summer	10.599	0.049	0.0	0.3	0.3	0.3	0.3 Flood Risk
2160 min Summer	10.586	0.036	0.0	0.3	0.3	0.3	0.2 Flood Risk
2880 min Summer	10.579	0.029	0.0	0.2	0.2	0.2	0.2 Flood Risk
4320 min Summer	10.571	0.021	0.0	0.1	0.1	0.1	0.1 Flood Risk
5760 min Summer	10.567	0.017	0.0	0.1	0.1	0.1	0.1 Flood Risk
7200 min Summer	10.564	0.014	0.0	0.1	0.1	0.1	0.1 Flood Risk
8640 min Summer	10.562	0.012	0.0	0.1	0.1	0.1	0.1 Flood Risk
10080 min Summer	10.561	0.011	0.0	0.1	0.1	0.1	0.0 Flood Risk

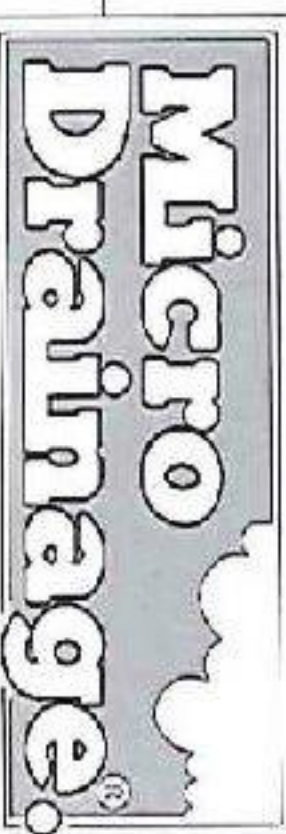
Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	118.408	0.0	1.9	19
30 min Summer	79.579	0.0	2.6	28
60 min Summer	51.031	0.0	3.3	44
120 min Summer	31.581	0.0	4.1	76
180 min Summer	23.488	0.0	4.6	106
240 min Summer	18.897	0.0	5.0	136
360 min Summer	13.902	0.0	5.5	198
480 min Summer	11.169	0.0	5.9	258
600 min Summer	9.417	0.0	6.2	318
720 min Summer	8.187	0.0	6.5	378
960 min Summer	6.558	0.0	6.9	498
1440 min Summer	4.789	0.0	7.6	740
2160 min Summer	3.489	0.0	8.3	1104
2880 min Summer	2.703	0.0	8.8	1468
4320 min Summer	2.020	0.0	9.5	2204
5760 min Summer	1.607	0.0	10.0	2936
7200 min Summer	1.346	0.0	10.5	3624
8640 min Summer	1.165	0.0	10.8	4304
10080 min Summer	1.032	0.0	11.1	5086

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horndean Road
 Fmsworth
 Plot 116 Drive

Date March 2017
 File Cascade.casx

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Source Control 2013.1.1

Cascade Summary of Results for Plot 116.srxx

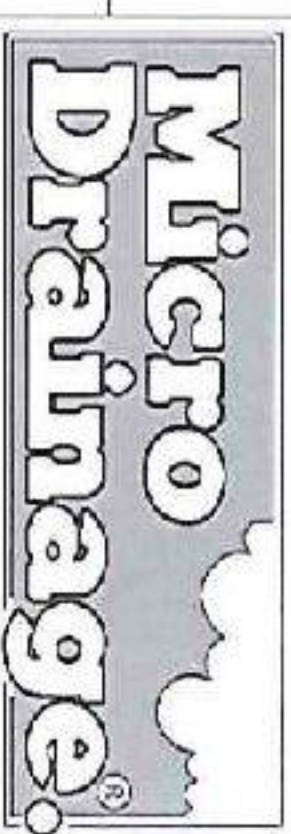
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	10.770	0.220	0.0	1.4	1.4	1.4	1.5 Flood Risk
30 min Winter	10.800	0.250	0.0	1.4	1.4	1.4	1.7 Flood Risk
60 min Winter	10.787	0.237	0.0	1.4	1.4	1.4	1.6 Flood Risk
120 min Winter	10.735	0.185	0.0	1.3	1.3	1.3	1.2 Flood Risk
180 min Winter	10.702	0.152	0.0	1.1	1.1	1.1	1.0 Flood Risk
240 min Winter	10.678	0.128	0.0	0.9	0.9	0.9	0.8 Flood Risk
360 min Winter	10.649	0.099	0.0	0.7	0.7	0.7	0.6 Flood Risk
480 min Winter	10.631	0.081	0.0	0.6	0.6	0.6	0.5 Flood Risk
600 min Winter	10.619	0.069	0.0	0.5	0.5	0.5	0.4 Flood Risk
720 min Winter	10.611	0.061	0.0	0.4	0.4	0.4	0.4 Flood Risk
960 min Winter	10.599	0.049	0.0	0.3	0.3	0.3	0.3 Flood Risk
1440 min Winter	10.586	0.036	0.0	0.3	0.3	0.3	0.2 Flood Risk
2160 min Winter	10.576	0.026	0.0	0.2	0.2	0.2	0.2 Flood Risk
2880 min Winter	10.571	0.021	0.0	0.1	0.1	0.1	0.1 Flood Risk
4320 min Winter	10.565	0.015	0.0	0.1	0.1	0.1	0.1 Flood Risk
5760 min Winter	10.562	0.012	0.0	0.1	0.1	0.1	0.1 Flood Risk
7200 min Winter	10.560	0.010	0.0	0.1	0.1	0.1	0.0 Flood Risk
8640 min Winter	10.559	0.009	0.0	0.1	0.1	0.1	0.0 Flood Risk
10080 min Winter	10.558	0.008	0.0	0.1	0.1	0.1	0.0 Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Winter	118.408	0.0	2.1	20			
30 min Winter	79.579	0.0	2.9	29			
60 min Winter	51.031	0.0	3.7	46			
120 min Winter	31.581	0.0	4.7	78			
180 min Winter	23.488	0.0	5.2	110			
240 min Winter	18.897	0.0	5.6	140			
360 min Winter	13.902	0.0	6.2	200			
480 min Winter	11.169	0.0	6.6	260			
600 min Winter	9.417	0.0	7.0	322			
720 min Winter	8.187	0.0	7.3	382			
960 min Winter	6.558	0.0	7.8	500			
1440 min Winter	4.789	0.0	8.5	738			
2160 min Winter	3.489	0.0	9.3	1108			
2880 min Winter	2.783	0.0	9.9	1472			
4320 min Winter	2.020	0.0	10.7	2168			
5760 min Winter	1.607	0.0	11.3	2824			
7200 min Winter	1.346	0.0	11.8	3584			
8640 min Winter	1.165	0.0	12.2	4384			
10080 min Winter	1.032	0.0	12.5	5032			

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horndean Road
 Emsworth
 Plot 116 Drive

Date March 2017
 File Cascade.casx

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Source Control 2013.1.1

Cascade Rainfall Details for Plot 116.srpx

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.009

Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: To:		From: To:	
0 5	0.000	5 10	0.009

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

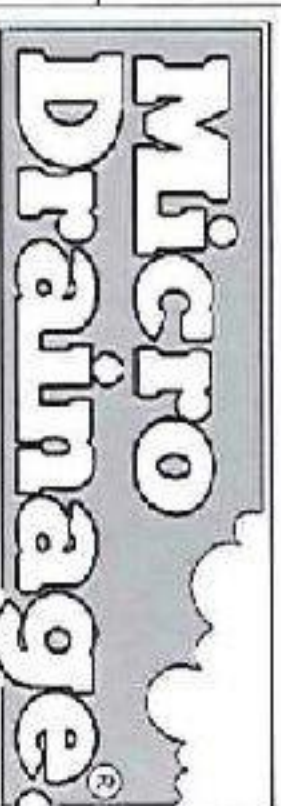
Plot 116 Drive

Date March 2017

Designed by KAM

File Cascade.casx

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Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Plot 116.srxx

Storage is Online Cover Level (m) 10.850

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.2
Membrane Percolation (mm/hr)	1000	Length (m)	7.0
Max Percolation (l/s)	6.2	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.550	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 10.550

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	1.4000	1.800	1.4000	3.400	1.4000	5.000	1.4000
0.400	1.4000	2.000	1.4000	3.600	1.4000	5.200	1.4000
0.600	1.4000	2.200	1.4000	3.800	1.4000	5.400	1.4000
0.800	1.4000	2.400	1.4000	4.000	1.4000	5.600	1.4000
1.000	1.4000	2.600	1.4000	4.200	1.4000	5.800	1.4000
1.200	1.4000	2.800	1.4000	4.400	1.4000	6.000	1.4000
1.400	1.4000	3.000	1.4000	4.600	1.4000		
1.600	1.4000	3.200	1.4000	4.800	1.4000		

Long Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

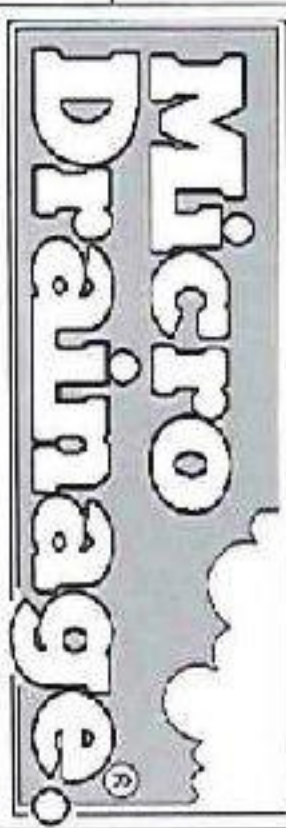
Plot 117 Drive

Date March 2017

Designed by KAM

File Cascade.casx

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Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Plot 117.srcx

Upstream Outflow To Overflow To Structures

(None) Road 1A.srcx

(None)

Half Drain Time : 15 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max 2 Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	10.745	0.195	0.0	1.4	1.4	1.3	Flood Risk
30 min Summer	10.776	0.226	0.0	1.4	1.4	1.5	Flood Risk
60 min Summer	10.777	0.227	0.0	1.4	1.4	1.5	Flood Risk
120 min Summer	10.744	0.194	0.0	1.4	1.4	1.3	Flood Risk
180 min Summer	10.718	0.168	0.0	1.2	1.2	1.1	Flood Risk
240 min Summer	10.697	0.147	0.0	1.0	1.0	1.0	Flood Risk
360 min Summer	10.670	0.120	0.0	0.8	0.8	0.8	Flood Risk
480 min Summer	10.651	0.101	0.0	0.7	0.7	0.7	Flood Risk
600 min Summer	10.638	0.088	0.0	0.6	0.6	0.6	Flood Risk
720 min Summer	10.629	0.079	0.0	0.6	0.6	0.5	Flood Risk
960 min Summer	10.615	0.065	0.0	0.5	0.5	0.4	Flood Risk
1440 min Summer	10.599	0.049	0.0	0.3	0.3	0.3	Flood Risk
2160 min Summer	10.586	0.036	0.0	0.3	0.3	0.2	Flood Risk
2880 min Summer	10.579	0.029	0.0	0.2	0.2	0.2	Flood Risk
4320 min Summer	10.571	0.021	0.0	0.1	0.1	0.1	Flood Risk
5760 min Summer	10.567	0.017	0.0	0.1	0.1	0.1	Flood Risk
7200 min Summer	10.564	0.014	0.0	0.1	0.1	0.1	Flood Risk
8640 min Summer	10.562	0.012	0.0	0.1	0.1	0.1	Flood Risk
10080 min Summer	10.561	0.011	0.0	0.1	0.1	0.0	Flood Risk

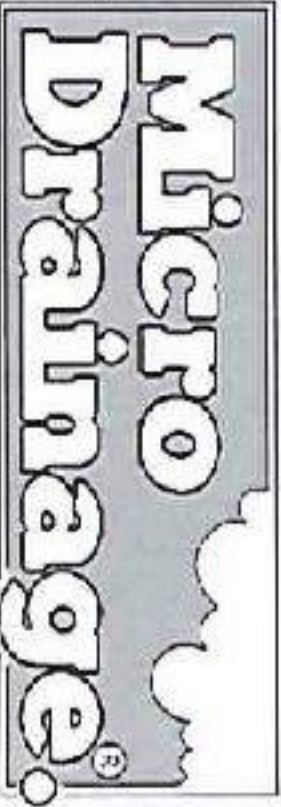
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.408	0.0	1.9	19
30 min Summer	79.579	0.0	2.6	28
60 min Summer	51.031	0.0	3.3	44
120 min Summer	31.581	0.0	4.1	76
180 min Summer	23.488	0.0	4.6	106
240 min Summer	18.897	0.0	5.0	136
360 min Summer	13.902	0.0	5.5	198
480 min Summer	11.169	0.0	5.9	258
600 min Summer	9.417	0.0	6.2	318
720 min Summer	8.187	0.0	6.5	378
960 min Summer	6.556	0.0	6.9	498
1440 min Summer	4.789	0.0	7.6	740
2160 min Summer	3.489	0.0	8.3	1104
2880 min Summer	2.783	0.0	8.8	1468
4320 min Summer	2.020	0.0	9.5	2204
5760 min Summer	1.607	0.0	10.0	2936
7200 min Summer	1.346	0.0	10.5	3624
8640 min Summer	1.165	0.0	10.8	4304
10080 min Summer	1.032	0.0	11.1	5088

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horndean Road
 Emsworth
 Plot 117 Drive

Date March 2017
 File Cascade.casx

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Source Control 2013.1.1

Cascade Summary of Results for Plot 117.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m ³)	Status
15 min Winter	10.770	0.220	0.0	1.4	1.4	1.4	1.5 Flood Risk
30 min Winter	10.800	0.250	0.0	1.4	1.4	1.4	1.7 Flood Risk
60 min Winter	10.787	0.237	0.0	1.4	1.4	1.4	1.6 Flood Risk
120 min Winter	10.735	0.185	0.0	1.3	1.3	1.3	1.2 Flood Risk
180 min Winter	10.702	0.152	0.0	1.1	1.1	1.1	1.0 Flood Risk
240 min Winter	10.676	0.128	0.0	0.9	0.9	0.9	0.8 Flood Risk
360 min Winter	10.649	0.099	0.0	0.7	0.7	0.7	0.6 Flood Risk
480 min Winter	10.631	0.081	0.0	0.6	0.6	0.6	0.5 Flood Risk
600 min Winter	10.619	0.069	0.0	0.5	0.5	0.5	0.4 Flood Risk
720 min Winter	10.611	0.061	0.0	0.4	0.4	0.4	0.4 Flood Risk
960 min Winter	10.599	0.049	0.0	0.3	0.3	0.3	0.3 Flood Risk
1440 min Winter	10.586	0.036	0.0	0.3	0.3	0.3	0.2 Flood Risk
2160 min Winter	10.576	0.026	0.0	0.2	0.2	0.2	0.2 Flood Risk
2880 min Winter	10.571	0.021	0.0	0.1	0.1	0.1	0.1 Flood Risk
4320 min Winter	10.565	0.015	0.0	0.1	0.1	0.1	0.1 Flood Risk
5760 min Winter	10.562	0.012	0.0	0.1	0.1	0.1	0.1 Flood Risk
7200 min Winter	10.560	0.010	0.0	0.1	0.1	0.1	0.0 Flood Risk
8640 min Winter	10.559	0.009	0.0	0.1	0.1	0.1	0.0 Flood Risk
10080 min Winter	10.558	0.008	0.0	0.1	0.1	0.1	0.0 Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)			
15 min Winter	118.408	0.0	2.1	20			
30 min Winter	79.579	0.0	2.9	29			
60 min Winter	51.031	0.0	3.7	46			
120 min Winter	31.581	0.0	4.7	78			
180 min Winter	23.408	0.0	5.2	110			
240 min Winter	18.897	0.0	5.6	140			
360 min Winter	13.902	0.0	6.2	200			
480 min Winter	11.169	0.0	6.6	260			
600 min Winter	9.417	0.0	7.0	322			
720 min Winter	8.187	0.0	7.3	382			
960 min Winter	6.558	0.0	7.8	500			
1440 min Winter	4.789	0.0	8.5	738			
2160 min Winter	3.489	0.0	9.3	1108			
2880 min Winter	2.783	0.0	9.9	1472			
4320 min Winter	2.020	0.0	10.7	2168			
5760 min Winter	1.607	0.0	11.3	2824			
7200 min Winter	1.346	0.0	11.8	3584			
8640 min Winter	1.165	0.0	12.2	4384			
10080 min Winter	1.032	0.0	12.5	5032			

Escher Silverman

Page 3

Lone Barn Studios

Horndean Road

Stanbridge Lane

Fmsworth

Romsey SO51 0HE

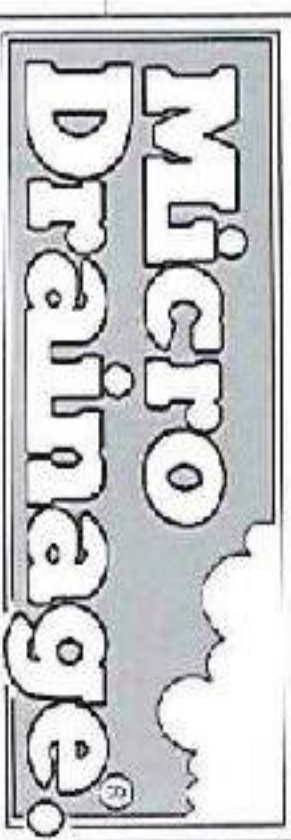
Plot 117 Drive

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Plot 117.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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	130

Time Area Diagram

Total Area (ha) 0.009

Time (mins)	Area (ha)	Time (mins)	Area (ha)		
From:	To:	From:	To:		
0	5	0.000	5	10	0.009

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

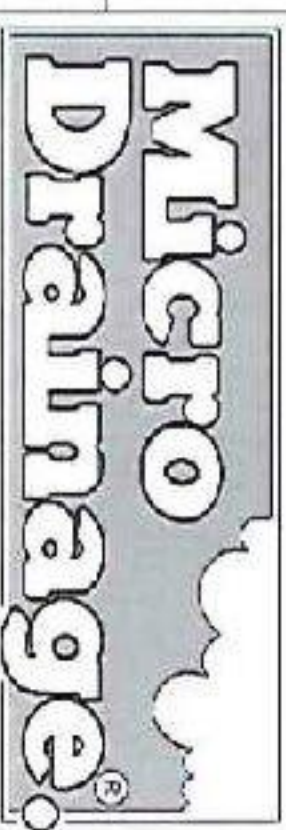
Plot 117 Drive

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Plot 117.srxx

Storage is Online Cover Level (m) 10.850

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.2
Membrane Percolation (mm/hr)	1000	Length (m)	7.0
Max Percolation (l/s)	6.2	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.550	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 10.550

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	1.4000	1.800	1.4000	3.400	1.4000	5.000	1.4000
0.400	1.4000	2.000	1.4000	3.600	1.4000	5.200	1.4000
0.600	1.4000	2.200	1.4000	3.800	1.4000	5.400	1.4000
0.800	1.4000	2.400	1.4000	4.000	1.4000	5.600	1.4000
1.000	1.4000	2.600	1.4000	4.200	1.4000	5.800	1.4000
1.200	1.4000	2.800	1.4000	4.400	1.4000	6.000	1.4000
1.400	1.4000	3.000	1.4000	4.600	1.4000		
1.600	1.4000	3.200	1.4000	4.800	1.4000		

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

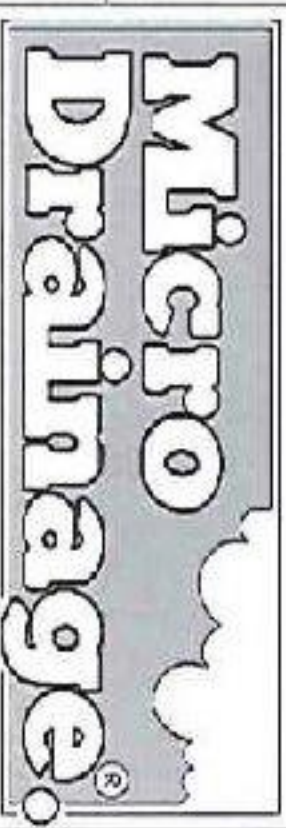
Plot 118-119 Drive

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Plot 118-119.srxx

Upstream Outflow To Overflow To Structures

(None) Road 1A.srxx

(None)

Hall Drain Time : 57 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	10.766	0.166	0.0	1.2	1.2	1.2	4.7 Flood Risk
30 min Summer	10.807	0.207	0.0	1.4	1.4	1.4	5.9 Flood Risk
60 min Summer	10.838	0.238	0.0	1.4	1.4	1.4	6.8 Flood Risk
120 min Summer	10.853	0.253	0.0	1.4	1.4	1.4	7.2 Flood Risk
180 min Summer	10.848	0.248	0.0	1.4	1.4	1.4	7.1 Flood Risk
240 min Summer	10.836	0.236	0.0	1.4	1.4	1.4	6.7 Flood Risk
360 min Summer	10.812	0.212	0.0	1.4	1.4	1.4	6.0 Flood Risk
480 min Summer	10.792	0.192	0.0	1.3	1.3	1.3	5.4 Flood Risk
600 min Summer	10.777	0.177	0.0	1.2	1.2	1.2	5.0 Flood Risk
720 min Summer	10.764	0.164	0.0	1.1	1.1	1.1	4.6 Flood Risk
960 min Summer	10.744	0.144	0.0	1.0	1.0	1.0	4.0 Flood Risk
1440 min Summer	10.717	0.117	0.0	0.8	0.8	0.8	3.2 Flood Risk
2160 min Summer	10.692	0.092	0.0	0.6	0.6	0.6	2.5 Flood Risk
2880 min Summer	10.676	0.076	0.0	0.5	0.5	0.5	2.0 Flood Risk
4320 min Summer	10.658	0.058	0.0	0.4	0.4	0.4	1.5 Flood Risk
5760 min Summer	10.647	0.047	0.0	0.3	0.3	0.3	1.2 Flood Risk
7200 min Summer	10.640	0.040	0.0	0.3	0.3	0.3	1.0 Flood Risk
8640 min Summer	10.634	0.034	0.0	0.2	0.2	0.2	0.8 Flood Risk
10080 min Summer	10.631	0.031	0.0	0.2	0.2	0.2	0.7 Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.408	0.0	5.3	23
30 min Summer	79.579	0.0	7.3	35
60 min Summer	51.031	0.0	9.4	54
120 min Summer	31.581	0.0	11.8	88
180 min Summer	23.488	0.0	13.2	122
240 min Summer	18.897	0.0	14.2	154
360 min Summer	13.902	0.0	15.7	218
480 min Summer	11.169	0.0	16.8	280
600 min Summer	9.417	0.0	17.7	342
720 min Summer	8.187	0.0	18.5	404
960 min Summer	6.558	0.0	19.8	526
1440 min Summer	4.709	0.0	21.6	770
2160 min Summer	3.489	0.0	23.6	1132
2880 min Summer	2.783	0.0	25.0	1500
4320 min Summer	2.020	0.0	27.0	2212
5760 min Summer	1.607	0.0	28.4	2944
7200 min Summer	1.346	0.0	29.5	3672
8640 min Summer	1.165	0.0	30.5	4408
10080 min Summer	1.032	0.0	31.2	5136

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

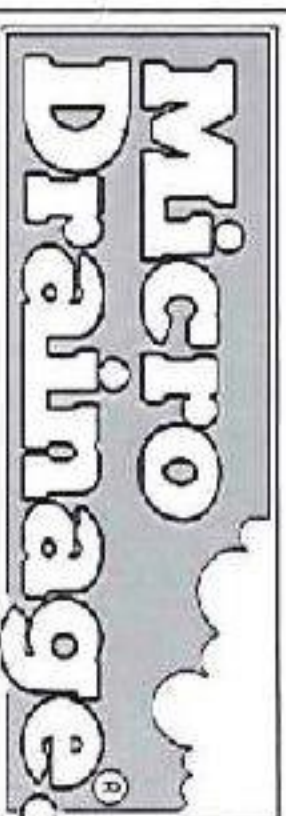
Plot 118-119 Drive

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

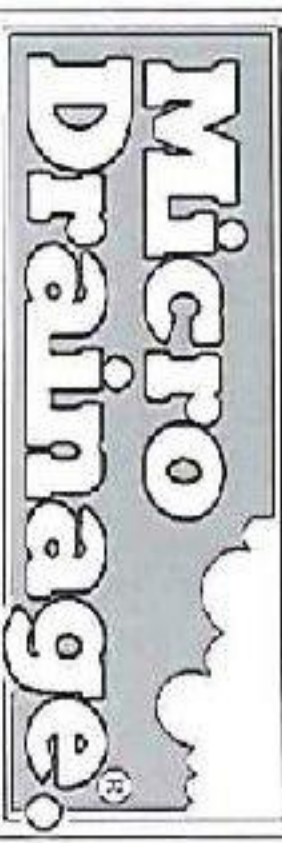
Source Control 2013.1.1

Cascade Summary of Results for Plot 118-119.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	10.787	0.187	0.0	1.3	1.3	5.3	Flood Risk
30 min Winter	10.837	0.237	0.0	1.4	1.4	6.8	Flood Risk
60 min Winter	10.871	0.271	0.0	1.4	1.4	7.8	Flood Risk
120 min Winter	10.882	0.282	0.0	1.4	1.4	8.1	Flood Risk
180 min Winter	10.869	0.269	0.0	1.4	1.4	7.7	Flood Risk
240 min Winter	10.848	0.248	0.0	1.4	1.4	7.1	Flood Risk
360 min Winter	10.809	0.209	0.0	1.4	1.4	5.9	Flood Risk
480 min Winter	10.784	0.184	0.0	1.3	1.3	5.2	Flood Risk
600 min Winter	10.765	0.165	0.0	1.2	1.2	4.6	Flood Risk
720 min Winter	10.750	0.150	0.0	1.0	1.0	4.2	Flood Risk
960 min Winter	10.727	0.127	0.0	0.9	0.9	3.5	Flood Risk
1440 min Winter	10.697	0.097	0.0	0.7	0.7	2.7	Flood Risk
2160 min Winter	10.673	0.073	0.0	0.5	0.5	1.9	Flood Risk
2880 min Winter	10.659	0.059	0.0	0.4	0.4	1.5	Flood Risk
4320 min Winter	10.643	0.043	0.0	0.3	0.3	1.1	Flood Risk
5760 min Winter	10.635	0.035	0.0	0.2	0.2	0.8	Flood Risk
7200 min Winter	10.629	0.029	0.0	0.2	0.2	0.6	Flood Risk
8640 min Winter	10.625	0.025	0.0	0.2	0.2	0.5	Flood Risk
10080 min Winter	10.622	0.022	0.0	0.2	0.2	0.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	118.408	0.0	6.0	22
30 min Winter	79.579	0.0	8.2	36
60 min Winter	51.031	0.0	10.6	58
120 min Winter	31.581	0.0	13.3	94
180 min Winter	23.488	0.0	14.9	132
240 min Winter	18.897	0.0	16.0	166
360 min Winter	13.902	0.0	17.7	230
480 min Winter	11.169	0.0	18.9	292
600 min Winter	9.417	0.0	20.0	356
720 min Winter	8.187	0.0	20.8	418
960 min Winter	6.556	0.0	22.2	542
1440 min Winter	4.789	0.0	24.3	784
2160 min Winter	3.489	0.0	26.5	1148
2880 min Winter	2.783	0.0	28.1	1504
4320 min Winter	2.020	0.0	30.4	2216
5760 min Winter	1.607	0.0	32.0	2928
7200 min Winter	1.346	0.0	33.3	3680
8640 min Winter	1.165	0.0	34.4	4368
10080 min Winter	1.032	0.0	35.3	5064

Lone Barn Studios	Horndean Road
Stanbridge Lane	Emsworth
Romsey SO51 0HE	Plot 118-119 Drive
Date March 2017	Designed by KAM
File Cascade.casx	Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Plot 118-119.srxx

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.026

Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: To:		From: To:	
0	5 0.000	5	10 0.026

Tone Barn Studios

Horndean Road

Stanbridge Lane

Fmsworth

Romsey SO51 0HE

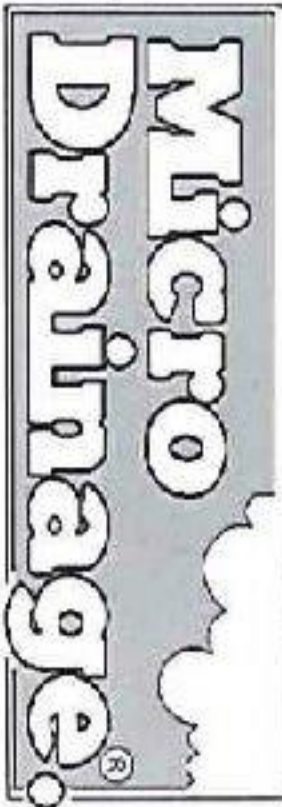
Plot 118-119 Drive

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Plot 118-119.srcx

Storage is Online Cover Level (m) 10.900

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	14.0
Max Percolation (l/s)	27.2	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	10.600	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 10.600

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	1.4000	1.800	1.4000	3.400	1.4000	5.000	1.4000
0.400	1.4000	2.000	1.4000	3.600	1.4000	5.200	1.4000
0.600	1.4000	2.200	1.4000	3.800	1.4000	5.400	1.4000
0.800	1.4000	2.400	1.4000	4.000	1.4000	5.600	1.4000
1.000	1.4000	2.600	1.4000	4.200	1.4000	5.800	1.4000
1.200	1.4000	2.800	1.4000	4.400	1.4000	6.000	1.4000
1.400	1.4000	3.000	1.4000	4.600	1.4000		
1.600	1.4000	3.200	1.4000	4.800	1.4000		

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

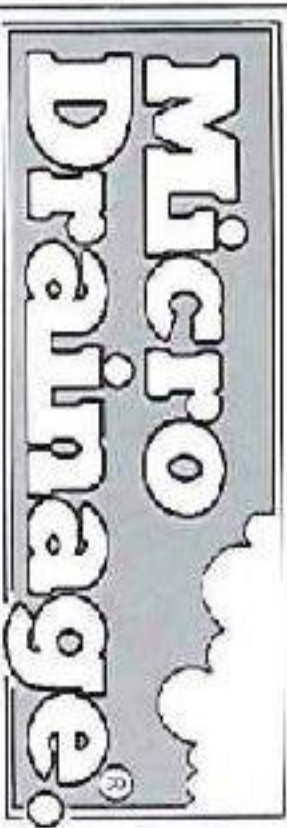
Road 1A Porous Paving

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 1A.srcx

Upstream Outflow To Overflow To
Structures

Attenuation Tank A.srcx (None) Overflow Tank.srcx
Attenuation Tank B.srcx
Attenuation Tank C.srcx
Plot 114.srcx
Plot 115.srcx
Plot 116.srcx
Plot 117.srcx
Plot 118-119.srcx
Road 2.srcx

Half Drain Time : 260 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.080	0.780	0.0	9.3	0.0	9.3	132.8	O K
30 min Summer	9.381	1.081	0.0	9.3	0.0	9.3	187.9	O K
60 min Summer	9.707	1.407	0.0	9.3	0.0	9.3	247.5	Flood Risk
120 min Summer	9.851	1.551	0.0	9.3	6.9	16.2	273.9	Flood Risk
180 min Summer	9.867	1.567	0.0	9.3	9.8	19.1	276.9	Flood Risk
240 min Summer	9.873	1.573	0.0	9.3	10.9	20.2	277.9	Flood Risk
360 min Summer	9.890	1.590	0.0	9.3	13.8	23.1	281.1	Flood Risk
480 min Summer	9.891	1.591	0.0	9.3	13.9	23.2	281.2	Flood Risk
600 min Summer	9.892	1.592	0.0	9.3	14.0	23.3	281.5	Flood Risk
720 min Summer	9.894	1.594	0.0	9.3	14.3	23.6	281.7	Flood Risk
960 min Summer	9.896	1.596	0.0	9.3	14.6	23.9	282.1	Flood Risk
1440 min Summer	9.890	1.590	0.0	9.3	13.7	23.0	281.0	Flood Risk
2160 min Summer	9.876	1.576	0.0	9.3	11.5	20.8	278.5	Flood Risk
2880 min Summer	9.845	1.545	0.0	9.3	6.2	15.5	272.7	Flood Risk
4320 min Summer	9.540	1.240	0.0	9.3	0.0	9.3	216.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
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15 min Summer	118.408	0.0	249.0	0.0	161
30 min Summer	79.579	0.0	336.7	0.0	222
60 min Summer	51.031	0.0	433.5	0.0	294
120 min Summer	31.581	0.0	537.9	46.5	300
180 min Summer	23.488	0.0	600.7	82.2	288
240 min Summer	18.897	0.0	644.7	105.6	314
360 min Summer	13.902	0.0	711.8	137.9	364
480 min Summer	11.169	0.0	762.7	158.8	416
600 min Summer	9.417	0.0	803.9	172.8	470
720 min Summer	8.187	0.0	838.8	181.3	524
960 min Summer	6.558	0.0	895.8	177.8	634
1440 min Summer	4.739	0.0	980.7	150.6	884
2160 min Summer	3.489	0.0	1070.9	105.6	1268
2880 min Summer	2.783	0.0	1138.0	53.6	1684
4320 min Summer	2.020	0.0	1236.7	0.0	2580

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

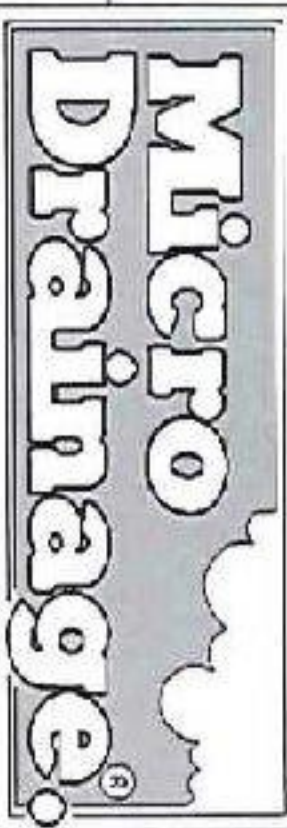
Road 1A Porous Paving

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 1A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
5760 min Summer	9.114	0.814	0.0	9.3	0.0	9.3	138.8	O K
7200 min Summer	8.804	0.504	0.0	9.3	0.0	9.3	82.2	O K
8640 min Summer	8.605	0.305	0.0	9.3	0.0	9.3	45.7	O K
10080 min Summer	8.505	0.205	0.0	9.3	0.0	9.3	27.4	O K
15 min Winter	9.186	0.886	0.0	9.3	0.0	9.3	152.1	O K
30 min Winter	9.521	1.221	0.0	9.3	0.0	9.3	213.5	O K
60 min Winter	9.823	1.523	0.0	9.3	3.8	13.1	268.8	Flood Risk
120 min Winter	9.869	1.569	0.0	9.3	10.0	19.3	277.1	Flood Risk
180 min Winter	9.874	1.574	0.0	9.3	11.0	20.3	278.1	Flood Risk
240 min Winter	9.881	1.581	0.0	9.3	12.3	21.6	279.4	Flood Risk
360 min Winter	9.902	1.602	0.0	9.3	15.4	24.7	283.2	Flood Risk
480 min Winter	9.911	1.611	0.0	9.3	16.7	26.0	284.8	Flood Risk
600 min Winter	9.916	1.616	0.0	9.3	17.8	27.1	286.2	Flood Risk
720 min Winter	9.921	1.621	0.0	9.3	18.1	27.4	286.7	Flood Risk
960 min Winter	9.920	1.620	0.0	9.3	18.1	27.4	286.6	Flood Risk
1440 min Winter	9.904	1.604	0.0	9.3	15.8	25.1	283.6	Flood Risk
2160 min Winter	9.874	1.574	0.0	9.3	11.1	20.4	278.2	Flood Risk
2880 min Winter	9.835	1.535	0.0	9.3	5.1	14.4	270.9	Flood Risk
4320 min Winter	9.287	0.987	0.0	9.3	0.0	9.3	170.6	O K
5760 min Winter	8.716	0.416	0.0	9.3	0.0	9.3	66.1	O K
7200 min Winter	8.494	0.194	0.0	9.0	0.0	9.0	25.3	O K
8640 min Winter	8.468	0.168	0.0	7.8	0.0	7.8	20.6	O K
10080 min Winter	8.449	0.149	0.0	6.9	0.0	6.9	17.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
5760 min Summer	1.607	0.0	1309.6	0.0	3280
7200 min Summer	1.346	0.0	1367.9	0.0	3944
8640 min Summer	1.165	0.0	1418.5	0.0	4584
10080 min Summer	1.032	0.0	1462.4	0.0	5168
15 min Winter	118.408	0.0	279.6	0.0	180
30 min Winter	79.579	0.0	377.9	0.0	249
60 min Winter	51.031	0.0	486.3	17.2	290
120 min Winter	31.581	0.0	603.2	87.5	266
180 min Winter	23.488	0.0	673.6	128.6	292
240 min Winter	18.897	0.0	722.9	156.0	252
360 min Winter	13.902	0.0	798.1	195.2	336
480 min Winter	11.169	0.0	855.1	221.8	366
600 min Winter	9.417	0.0	901.3	240.5	426
720 min Winter	8.187	0.0	940.4	253.9	488
960 min Winter	6.558	0.0	1004.4	262.7	612
1440 min Winter	4.789	0.0	1099.6	223.9	866
2160 min Winter	3.489	0.0	1200.8	143.4	1264
2880 min Winter	2.783	0.0	1276.1	58.5	1756
4320 min Winter	2.020	0.0	1387.2	0.0	2696
5760 min Winter	1.607	0.0	1469.1	0.0	3304
7200 min Winter	1.346	0.0	1534.9	0.0	3696
8640 min Winter	1.165	0.0	1592.0	0.0	4416
10080 min Winter	1.032	0.0	1641.7	0.0	5144

Micro Drainage	Source Control 2013.1.1
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Cascade Rainfall Details for Road 1A.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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.232

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 5	0.000	5 10	0.116	10 15	0.116

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

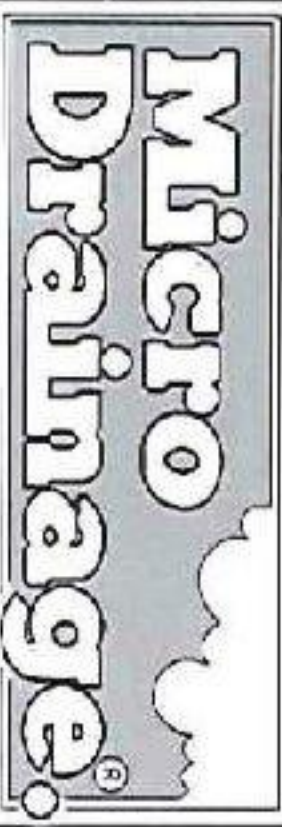
Road 1A Porous Paving

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Road 1A.srxc

Storage is Online Cover Level (m) 9.950

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.5
Membrane Percolation (mm/hr)	1000	Length (m)	111.0
Max Percolation (l/s)	169.6	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.300	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 8.300

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	9.3000	1.800	9.3000	3.400	9.3000	5.000	9.3000
0.400	9.3000	2.000	9.3000	3.600	9.3000	5.200	9.3000
0.600	9.3000	2.200	9.3000	3.800	9.3000	5.400	9.3000
0.800	9.3000	2.400	9.3000	4.000	9.3000	5.600	9.3000
1.000	9.3000	2.600	9.3000	4.200	9.3000	5.800	9.3000
1.200	9.3000	2.800	9.3000	4.400	9.3000	6.000	9.3000
1.400	9.3000	3.000	9.3000	4.600	9.3000		
1.600	9.3000	3.200	9.3000	4.800	9.3000		

Pipe Overflow Control

Diameter (m) 0.225 Entry Loss Coefficient 0.500
 Slope (1:X) 150.0 Coefficient of Contraction 0.600
 Length (m) 5.000 Upstream Invert Level (m) 9.750
 Roughness k (mm) 0.600

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

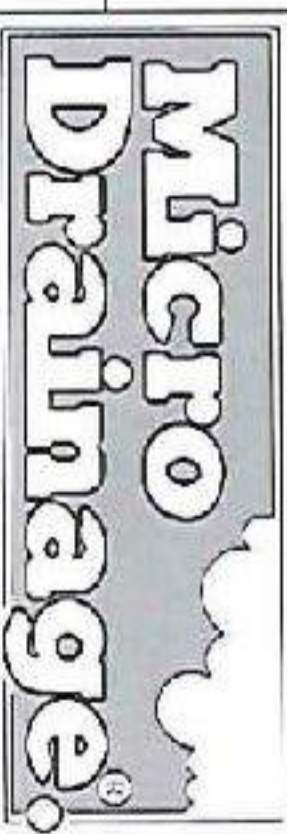
Overflow Tank

Date March 2017

Designed by KAM

File Cascade.casx

Checked by

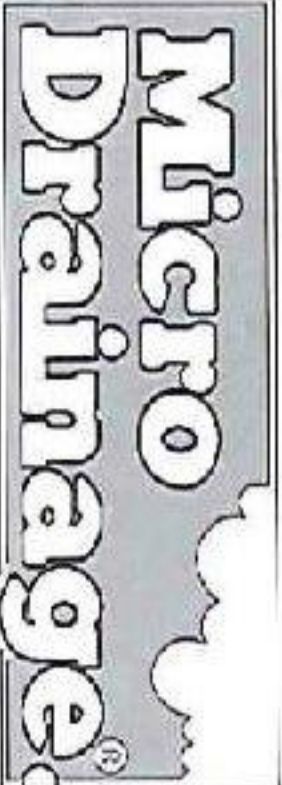


Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Overflow Tank.srxx

Upstream Structures		Outflow To Overflow To			
Road 1A.srxx		(None)		(None)	
Attenuation Tank A.srxx					
Attenuation Tank B.srxx					
Attenuation Tank C.srxx					
Plot 114.srxx					
Plot 115.srxx					
Plot 116.srxx					
Plot 117.srxx					
Plot 118-119.srxx					
Road 2.srxx					
Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status	
15 min Summer	8.550	0.000	0.0	O K	
30 min Summer	8.550	0.000	0.0	O K	
60 min Summer	8.550	0.000	0.0	O K	
120 min Summer	8.643	0.093	46.5	O K	
180 min Summer	8.714	0.164	82.2	O K	
240 min Summer	8.761	0.211	105.6	O K	
360 min Summer	8.826	0.276	137.9	O K	
480 min Summer	8.868	0.318	158.8	O K	
600 min Summer	8.896	0.346	172.8	O K	
720 min Summer	8.913	0.363	181.3	O K	
960 min Summer	8.906	0.356	177.8	O K	
1440 min Summer	8.851	0.301	150.6	O K	
2160 min Summer	8.761	0.211	105.6	O K	
2880 min Summer	8.657	0.107	53.6	O K	
4320 min Summer	8.550	0.000	0.0	O K	
5760 min Summer	8.550	0.000	0.0	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	118.408	0.0	0		
30 min Summer	79.579	0.0	0		
60 min Summer	51.031	0.0	0		
120 min Summer	31.581	0.0	430		
180 min Summer	23.488	0.0	488		
240 min Summer	18.897	0.0	532		
360 min Summer	13.902	0.0	610		
480 min Summer	11.169	0.0	682		
600 min Summer	9.417	0.0	750		
720 min Summer	8.187	0.0	822		
960 min Summer	6.558	0.0	978		
1440 min Summer	4.789	0.0	1184		
2160 min Summer	3.489	0.0	1532		
2880 min Summer	2.783	0.0	1912		
4320 min Summer	2.020	0.0	0		
5760 min Summer	1.607	0.0	0		

Lone Barn Studios	Hordean Road	
Stanbridge Lane	Emsworth Overflow Tank	
Romsey SO51 0HE		
Date March 2017	Designed by KAM	
File Cascade.casx	Checked by	
Micro Drainage	Source Control 2013.1.1	

Cascade Summary of Results for Overflow Tank.srx

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m ³)	Status
7200 min Summer	8.550	0.000	0.0	O K
8640 min Summer	8.550	0.000	0.0	O K
10080 min Summer	8.550	0.000	0.0	O K
15 min Winter	8.550	0.000	0.0	O K
30 min Winter	8.550	0.000	0.0	O K
60 min Winter	8.584	0.034	17.2	O K
120 min Winter	8.725	0.175	87.5	O K
180 min Winter	8.807	0.257	128.6	O K
240 min Winter	8.862	0.312	156.0	O K
360 min Winter	8.940	0.390	195.2	O K
480 min Winter	8.994	0.444	221.8	O K
600 min Winter	9.031	0.481	240.5	O K
720 min Winter	9.058	0.508	253.9	O K
960 min Winter	9.075	0.525	262.7	O K
1440 min Winter	8.998	0.448	223.9	O K
2160 min Winter	8.837	0.287	143.4	O K
2880 min Winter	8.667	0.117	58.5	O K
4320 min Winter	8.550	0.000	0.0	O K
5760 min Winter	8.550	0.000	0.0	O K
7200 min Winter	8.550	0.000	0.0	O K
8640 min Winter	8.550	0.000	0.0	O K
10080 min Winter	8.550	0.000	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	
7200 min Summer	1.346	0.0	0	
8640 min Summer	1.165	0.0	0	
10080 min Summer	1.032	0.0	0	
15 min Winter	118.408	0.0	0	
30 min Winter	79.579	0.0	0	
60 min Winter	51.031	0.0	378	
120 min Winter	31.581	0.0	472	
180 min Winter	23.488	0.0	532	
240 min Winter	18.897	0.0	578	
360 min Winter	13.902	0.0	658	
480 min Winter	11.169	0.0	728	
600 min Winter	9.417	0.0	794	
720 min Winter	8.187	0.0	858	
960 min Winter	6.558	0.0	1002	
1440 min Winter	4.789	0.0	1234	
2160 min Winter	3.489	0.0	1636	
2880 min Winter	2.783	0.0	2048	
4320 min Winter	2.020	0.0	0	
5760 min Winter	1.607	0.0	0	
7200 min Winter	1.346	0.0	0	
8640 min Winter	1.165	0.0	0	
10080 min Winter	1.032	0.0	0	

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

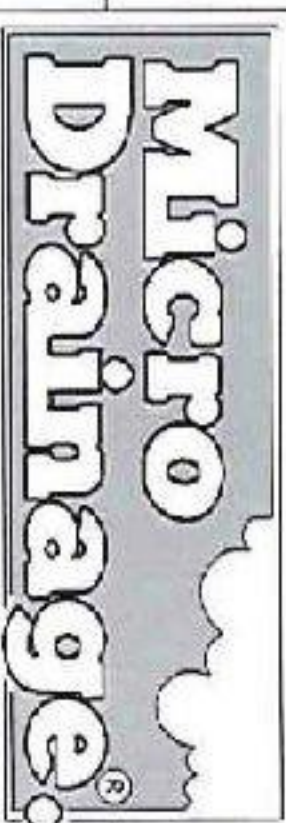
Overflow Tank

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Overflow Tank.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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Escher Silverman

Page 4

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

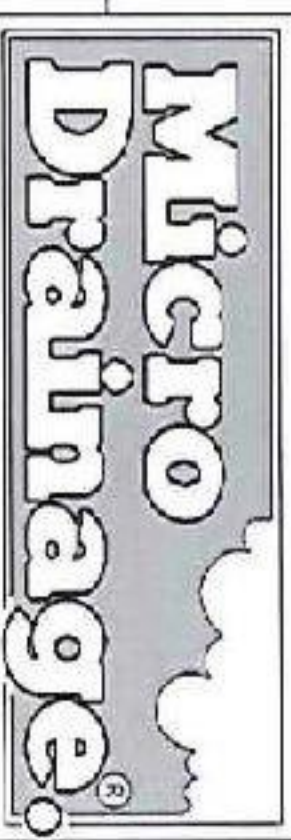
Overflow Tank

Dale March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Overflow Tank.srcx

Storage is Offline Dividing Weir Level (m) 8.550
Cover Level (m) 9.750

Tank or Pond Structure

Invert Level (m) 8.550

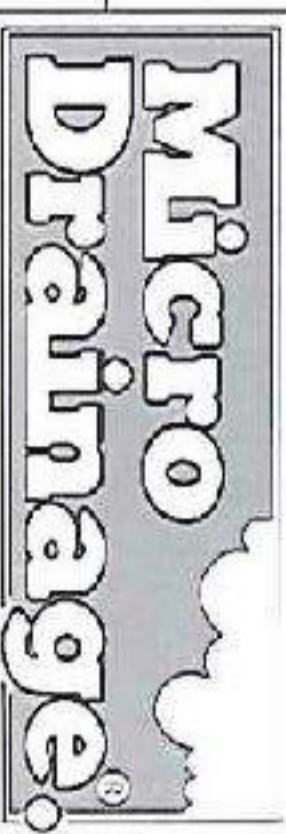
Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	500.0	0.900	500.0

Lone Barn Studios
 Stanbridge Lane
 Romsy SO51 0HE

Hordean Road
 Fmsworth
 Road 2 Porous Paving

Date March 2017
 File Cascade.casx

Designed by KAM
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Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 2.srxx

Upstream Outflow To Overflow To Structures

(None) Road 1A.srxx

(None)

Half Drain Time : 191 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.903	0.503	0.0	5.0	5.0	50.5	O K
30 min Summer	10.054	0.654	0.0	5.0	5.0	67.0	O K
60 min Summer	10.191	0.791	0.0	5.0	5.0	81.8	O K
120 min Summer	10.279	0.879	0.0	5.0	5.0	91.4	Flood Risk
180 min Summer	10.287	0.887	0.0	5.0	5.0	92.2	Flood Risk
240 min Summer	10.275	0.875	0.0	5.0	5.0	90.9	Flood Risk
360 min Summer	10.241	0.841	0.0	5.0	5.0	87.2	Flood Risk
480 min Summer	10.200	0.800	0.0	5.0	5.0	82.7	O K
600 min Summer	10.156	0.756	0.0	5.0	5.0	78.0	O K
720 min Summer	10.112	0.712	0.0	5.0	5.0	73.2	O K
960 min Summer	10.028	0.628	0.0	5.0	5.0	64.1	O K
1440 min Summer	9.878	0.478	0.0	5.0	5.0	47.8	O K
2160 min Summer	9.712	0.312	0.0	5.0	5.0	29.7	O K
2880 min Summer	9.616	0.216	0.0	5.0	5.0	19.4	O K
4320 min Summer	9.560	0.160	0.0	4.0	4.0	13.3	O K
5760 min Summer	9.530	0.130	0.0	3.3	3.3	10.0	O K
7200 min Summer	9.510	0.110	0.0	2.8	2.8	7.9	O K
8640 min Summer	9.496	0.096	0.0	2.4	2.4	6.3	O K
10080 min Summer	9.485	0.085	0.0	2.1	2.1	5.2	O K

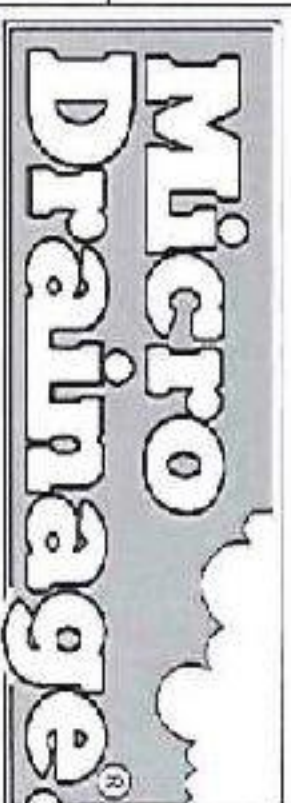
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.408	0.0	55.2	28
30 min Summer	79.579	0.0	74.9	42
60 min Summer	51.031	0.0	96.5	70
120 min Summer	31.581	0.0	119.8	126
180 min Summer	23.488	0.0	133.9	164
240 min Summer	18.897	0.0	143.7	196
360 min Summer	13.902	0.0	158.7	260
480 min Summer	11.169	0.0	170.0	330
600 min Summer	9.417	0.0	179.2	398
720 min Summer	8.187	0.0	187.0	466
960 min Summer	6.558	0.0	199.7	596
1440 min Summer	4.789	0.0	218.6	846
2160 min Summer	3.489	0.0	238.6	1196
2880 min Summer	2.783	0.0	253.5	1512
4320 min Summer	2.020	0.0	275.3	2216
5760 min Summer	1.607	0.0	291.3	2944
7200 min Summer	1.346	0.0	304.1	3680
8640 min Summer	1.165	0.0	315.1	4408
10080 min Summer	1.032	0.0	324.6	5144

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horndean Road
 Emsworth
 Road 2 Porous Paving

Date March 2017
 File Cascade.casx

Designed by KAM
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Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 2.srccx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	9.965	0.565	0.0	5.0	5.0	57.2	O K
30 min Winter	10.138	0.738	0.0	5.0	5.0	76.0	O K
60 min Winter	10.298	0.898	0.0	5.0	5.0	93.4	Flood Risk
120 min Winter	10.411	1.011	0.0	5.0	5.0	105.7	Flood Risk
180 min Winter	10.429	1.029	0.0	5.0	5.0	107.6	Flood Risk
240 min Winter	10.408	1.008	0.0	5.0	5.0	105.4	Flood Risk
360 min Winter	10.361	0.961	0.0	5.0	5.0	100.2	Flood Risk
480 min Winter	10.300	0.900	0.0	5.0	5.0	93.6	Flood Risk
600 min Winter	10.233	0.833	0.0	5.0	5.0	86.3	Flood Risk
720 min Winter	10.165	0.765	0.0	5.0	5.0	78.9	O K
960 min Winter	10.033	0.633	0.0	5.0	5.0	64.6	O K
1440 min Winter	9.806	0.406	0.0	5.0	5.0	40.0	O K
2160 min Winter	9.604	0.204	0.0	5.0	5.0	18.1	O K
2880 min Winter	9.564	0.164	0.0	4.1	4.1	13.7	O K
4320 min Winter	9.521	0.121	0.0	3.0	3.0	9.0	O K
5760 min Winter	9.496	0.096	0.0	2.4	2.4	6.4	O K
7200 min Winter	9.481	0.081	0.0	2.0	2.0	4.7	O K
8640 min Winter	9.470	0.070	0.0	1.8	1.8	3.5	O K
10080 min Winter	9.462	0.062	0.0	1.6	1.6	2.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Winter	110.408	0.0	62.1	28			
30 min Winter	79.579	0.0	84.1	42			
60 min Winter	51.031	0.0	108.3	70			
120 min Winter	31.581	0.0	134.4	126			
180 min Winter	23.488	0.0	150.2	180			
240 min Winter	18.897	0.0	161.2	224			
360 min Winter	13.902	0.0	178.0	282			
480 min Winter	11.169	0.0	190.7	358			
600 min Winter	9.417	0.0	201.0	432			
720 min Winter	8.187	0.0	209.7	504			
960 min Winter	6.558	0.0	224.0	640			
1440 min Winter	4.789	0.0	245.2	886			
2160 min Winter	3.489	0.0	267.7	1160			
2880 min Winter	2.783	0.0	284.4	1508			
4320 min Winter	2.020	0.0	308.9	2224			
5760 min Winter	1.607	0.0	327.0	2952			
7200 min Winter	1.346	0.0	341.4	3680			
8640 min Winter	1.165	0.0	353.9	4376			
10080 min Winter	1.032	0.0	364.7	5112			

Lone Barn Studios

Horndean Road

Stanbridge Lane

Fmsworth

Romsey SO51 0HE

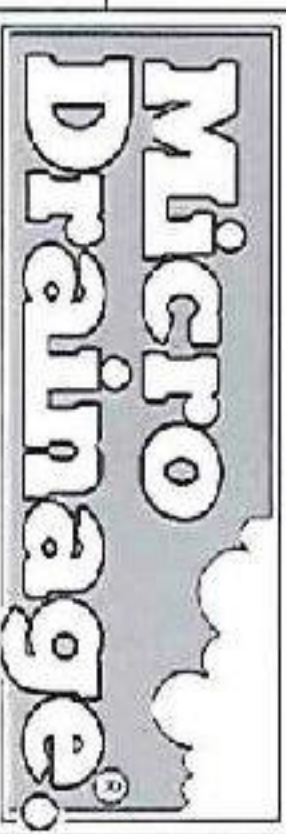
Road 2 Porous Paving

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Road 2.srxc

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)		19.400	Shortest Storm (mins)	15	
Ratio R		0.350	Longest Storm (mins)	10080	
Summer Storms		Yes	Climate Change %	+30	

Time Area Diagram

Total Area (ha) 0.257

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
0	5	0.000	5	10	0.128
				10	15
					0.129

Lone Barn Studios

Horndean Road

Stanbridge Lane

Fmsworth

Romsey SO51 0HE

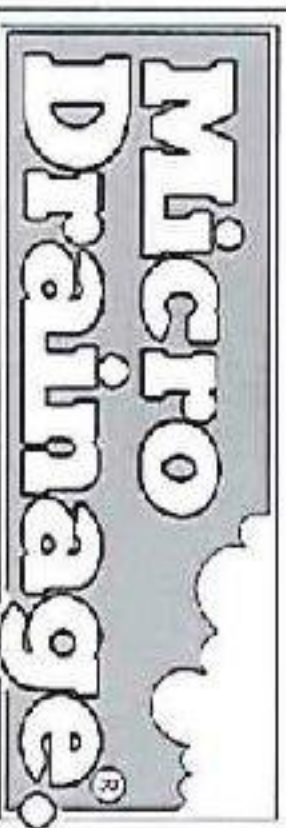
Road 2 Porous Paving

Date March 2017

Designed by KAM

File Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Road 2.srxx

Storage is Online Cover Level (m) 10.500

Porous Car Park Structure

Infiltration Coefficient Hase (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	75.4
Max Percolation (l/s)	100.5	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	9.400	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 9.400

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	5.00000	1.800	5.00000	3.400	5.00000	5.000	5.00000
0.400	5.00000	2.000	5.00000	3.600	5.00000	5.200	5.00000
0.600	5.00000	2.200	5.00000	3.800	5.00000	5.400	5.00000
0.800	5.00000	2.400	5.00000	4.000	5.00000	5.600	5.00000
1.000	5.00000	2.600	5.00000	4.200	5.00000	5.800	5.00000
1.200	5.00000	2.800	5.00000	4.400	5.00000	6.000	5.00000
1.400	5.00000	3.000	5.00000	4.600	5.00000		
1.600	5.00000	3.200	5.00000	4.800	5.00000		

Appendix B

Road 1B-Road 1C – Drainage Calculations

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

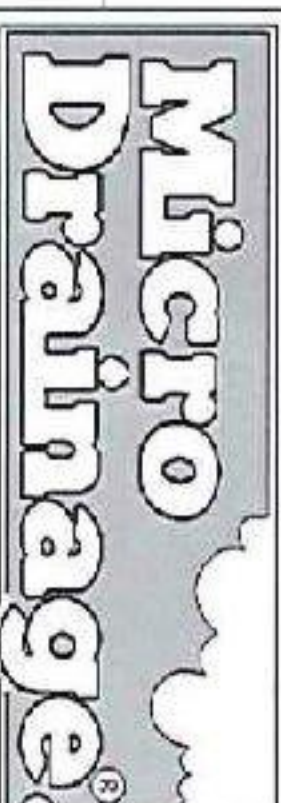
Road 1B Porous Paving

Date March 2017

Designed by KAM

File 1B-1C Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 1B.srx

Upstream Outflow To Overflow To
Structures

(None) Road 1C.srx

(None)

Half Drain Time : 159 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.346	0.446	0.0	5.0	5.0	43.7	O K
30 min Summer	9.481	0.581	0.0	5.0	5.0	58.0	O K
60 min Summer	9.601	0.701	0.0	5.0	5.0	70.6	Flood Risk
120 min Summer	9.671	0.771	0.0	5.0	5.0	78.1	Flood Risk
180 min Summer	9.675	0.775	0.0	5.0	5.0	78.5	Flood Risk
240 min Summer	9.662	0.762	0.0	5.0	5.0	77.1	Flood Risk
360 min Summer	9.629	0.729	0.0	5.0	5.0	73.6	Flood Risk
480 min Summer	9.587	0.687	0.0	5.0	5.0	69.2	Flood Risk
600 min Summer	9.544	0.644	0.0	5.0	5.0	64.6	O K
720 min Summer	9.501	0.601	0.0	5.0	5.0	60.1	O K
960 min Summer	9.420	0.520	0.0	5.0	5.0	51.5	O K
1440 min Summer	9.282	0.382	0.0	5.0	5.0	36.9	O K
2160 min Summer	9.144	0.244	0.0	5.0	5.0	22.4	O K
2880 min Summer	9.088	0.188	0.0	4.7	4.7	16.4	O K
4320 min Summer	9.042	0.142	0.0	3.6	3.6	11.7	O K
5760 min Summer	9.016	0.116	0.0	2.9	2.9	8.8	O K
7200 min Summer	8.998	0.098	0.0	2.5	2.5	7.0	O K
8640 min Summer	8.906	0.006	0.0	2.1	2.1	5.7	O K
10080 min Summer	8.976	0.076	0.0	1.9	1.9	4.7	O K

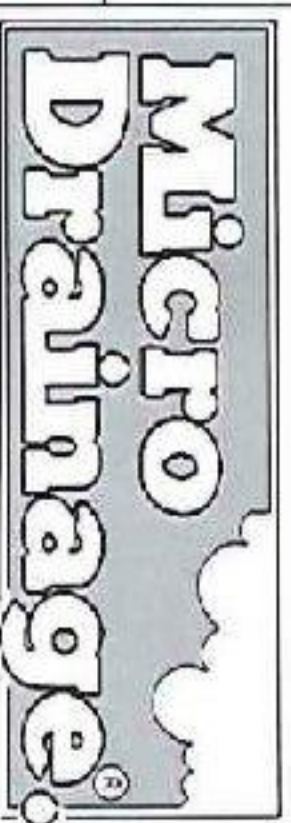
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	119.147	0.0	48.3	28
30 min Summer	80.259	0.0	65.6	41
60 min Summer	51.576	0.0	84.8	68
120 min Summer	31.966	0.0	105.6	124
180 min Summer	23.783	0.0	118.0	156
240 min Summer	19.132	0.0	126.6	186
360 min Summer	14.103	0.0	140.1	254
480 min Summer	11.339	0.0	150.3	322
600 min Summer	9.565	0.0	158.5	390
720 min Summer	8.320	0.0	165.4	456
960 min Summer	6.669	0.0	176.8	586
1440 min Summer	4.874	0.0	193.7	830
2160 min Summer	3.554	0.0	211.6	1160
2880 min Summer	2.836	0.0	224.9	1500
4320 min Summer	2.060	0.0	244.3	2216
5760 min Summer	1.640	0.0	258.6	2944
7200 min Summer	1.375	0.0	270.2	3680
8640 min Summer	1.191	0.0	280.1	4408
10080 min Summer	1.055	0.0	288.6	5144

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horndean Road
 Emsworth
 Road 1B Porous Paving

Date March 2017
 File 1B-1C Cascade.casx

Designed by KAM
 Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 1B.srxx

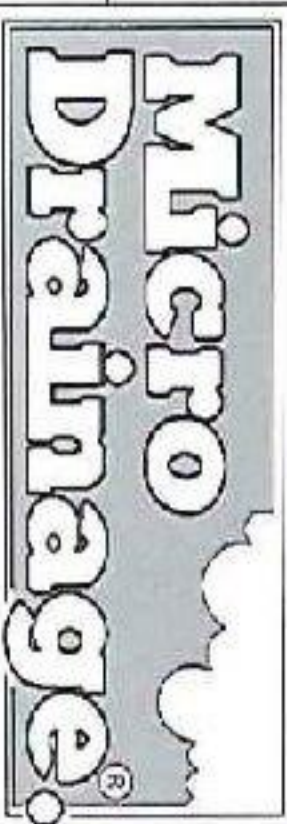
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	9.401	0.501	0.0	5.0	5.0	49.6	O K
30 min Winter	9.557	0.657	0.0	5.0	5.0	65.9	Flood Risk
60 min Winter	9.697	0.797	0.0	5.0	5.0	80.8	Flood Risk
120 min Winter	9.789	0.889	0.0	5.0	5.0	90.5	Flood Risk
180 min Winter	9.795	0.895	0.0	5.0	5.0	91.1	Flood Risk
240 min Winter	9.774	0.874	0.0	5.0	5.0	88.9	Flood Risk
360 min Winter	9.725	0.825	0.0	5.0	5.0	83.7	Flood Risk
480 min Winter	9.661	0.761	0.0	5.0	5.0	77.0	Flood Risk
600 min Winter	9.594	0.694	0.0	5.0	5.0	69.9	Flood Risk
720 min Winter	9.526	0.626	0.0	5.0	5.0	62.8	O K
960 min Winter	9.400	0.500	0.0	5.0	5.0	49.4	O K
1440 min Winter	9.199	0.299	0.0	5.0	5.0	28.2	O K
2160 min Winter	9.080	0.180	0.0	4.5	4.5	15.7	O K
2880 min Winter	9.046	0.146	0.0	3.6	3.6	12.0	O K
4320 min Winter	9.007	0.107	0.0	2.7	2.7	7.9	O K
5760 min Winter	8.986	0.086	0.0	2.1	2.1	5.7	O K
7200 min Winter	8.972	0.072	0.0	1.8	1.8	4.2	O K
8640 min Winter	8.962	0.062	0.0	1.6	1.6	3.2	O K
10080 min Winter	8.955	0.055	0.0	1.4	1.4	2.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Winter	119.147	0.0	54.3	28			
30 min Winter	80.259	0.0	73.7	41			
60 min Winter	51.576	0.0	95.2	68			
120 min Winter	31.966	0.0	118.4	124			
180 min Winter	23.783	0.0	132.4	176			
240 min Winter	19.132	0.0	142.1	200			
360 min Winter	14.103	0.0	157.2	276			
480 min Winter	11.339	0.0	168.6	350			
600 min Winter	9.565	0.0	177.8	424			
720 min Winter	8.320	0.0	185.6	492			
960 min Winter	6.669	0.0	198.3	624			
1440 min Winter	4.874	0.0	217.3	854			
2160 min Winter	3.554	0.0	237.4	1152			
2880 min Winter	2.836	0.0	252.3	1508			
4320 min Winter	2.060	0.0	274.2	2216			
5760 min Winter	1.640	0.0	290.3	2944			
7200 min Winter	1.375	0.0	303.4	3680			
8640 min Winter	1.191	0.0	314.6	4416			
10080 min Winter	1.055	0.0	324.3	5136			

Lone Barn Studios
Stanbridge Lane
Romsey SO51 0HE

Horndean Road
Emsworth
Road 1B Porous Paving

Date March 2017
File 1B-1C Cascade.casx

Designed by KAM
Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Road 1B.srxx

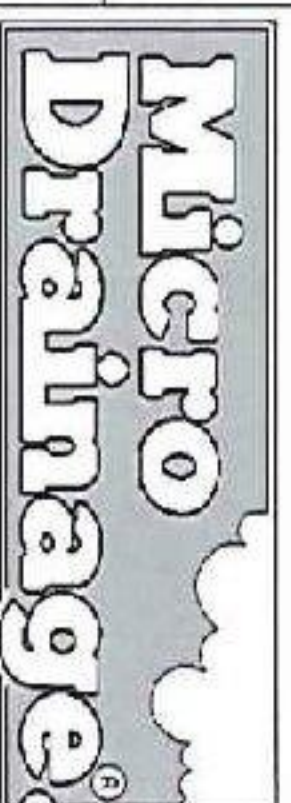
Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region England and Wales		Cv (Winter)	0.840
M5-60 (mm)	19.600	Shortest Storm (mins)	15
Ratio R	0.345	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.224

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: 0	To: 5	From: 5	To: 10	From: 10	To: 15
	0.000		0.112		0.112

Lone Barn Studios	Horndean Road
Stanbridge Lane	Emsworth
Romsey SO51 0HF	Road 1B Porous Paving
Date March 2017	Designed by KAM
File 1B-1C Cascade.casx	Checked by
Micro Drainage	Source Control 2013.1.1



Cascade Model Details for Road 1B.srcx

Storage is Online Cover Level (m) 9.850

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.5
Membrane Percolation (mm/hr)	1000	Length (m)	64.0
Max Percolation (l/s)	97.8	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.900	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 8.900

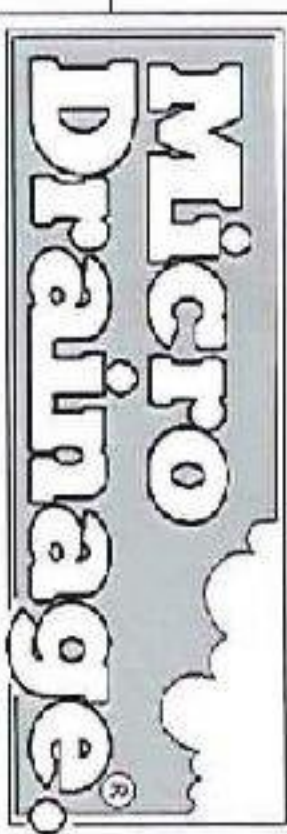
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	5.0000	1.800	5.0000	3.400	5.0000	5.000	5.0000
0.400	5.0000	2.000	5.0000	3.600	5.0000	5.200	5.0000
0.600	5.0000	2.200	5.0000	3.800	5.0000	5.400	5.0000
0.800	5.0000	2.400	5.0000	4.000	5.0000	5.600	5.0000
1.000	5.0000	2.600	5.0000	4.200	5.0000	5.800	5.0000
1.200	5.0000	2.800	5.0000	4.400	5.0000	6.000	5.0000
1.400	5.0000	3.000	5.0000	4.600	5.0000		
1.600	5.0000	3.200	5.0000	4.800	5.0000		

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horndean Road
 Emsworth
 Road 1C Porous Paving

Date March 2017
 File 1B-1C Cascade.casx

Designed by KAM
 Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 1C.srccx

Upstream Outflow To Overflow To Structures

Road 1B.srccx (None) (None)

Half Drain Time : 517 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	8.448	0.288	0.0	3.3	3.3	49.5	O K
30 min Summer	8.539	0.379	0.0	3.3	3.3	69.7	O K
60 min Summer	8.639	0.479	0.0	3.3	3.3	92.3	O K
120 min Summer	8.747	0.587	0.0	3.3	3.3	116.4	O K
180 min Summer	8.810	0.650	0.0	3.3	3.3	130.6	O K
240 min Summer	8.852	0.692	0.0	3.3	3.3	140.1	O K
360 min Summer	8.914	0.754	0.0	3.3	3.3	153.9	O K
480 min Summer	8.955	0.795	0.0	3.3	3.3	163.2	O K
600 min Summer	8.984	0.824	0.0	3.3	3.3	169.8	O K
720 min Summer	9.005	0.845	0.0	3.3	3.3	174.5	O K
960 min Summer	8.995	0.835	0.0	3.3	3.3	172.1	O K
1440 min Summer	8.953	0.793	0.0	3.3	3.3	162.8	O K
2160 min Summer	8.879	0.719	0.0	3.3	3.3	146.1	O K
2880 min Summer	8.796	0.636	0.0	3.3	3.3	127.5	O K
4320 min Summer	8.646	0.486	0.0	3.3	3.3	93.9	O K
5760 min Summer	8.526	0.366	0.0	3.3	3.3	66.8	O K
7200 min Summer	8.437	0.277	0.0	3.3	3.3	47.0	O K
8640 min Summer	8.380	0.220	0.0	3.3	3.3	34.0	O K
10080 min Summer	8.352	0.192	0.0	3.2	3.2	27.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	119.147	0.0	85.6	144
30 min Summer	80.259	0.0	117.2	206
60 min Summer	51.576	0.0	152.2	278
120 min Summer	31.966	0.0	189.8	360
180 min Summer	23.783	0.0	212.4	416
240 min Summer	19.132	0.0	228.1	460
360 min Summer	14.103	0.0	252.6	538
480 min Summer	11.339	0.0	271.0	608
600 min Summer	9.565	0.0	285.8	674
720 min Summer	8.320	0.0	298.3	740
960 min Summer	6.669	0.0	318.8	878
1440 min Summer	4.874	0.0	349.1	1082
2160 min Summer	3.554	0.0	381.0	1436
2880 min Summer	2.836	0.0	404.5	1824
4320 min Summer	2.060	0.0	438.5	2568
5760 min Summer	1.640	0.0	463.1	3280
7200 min Summer	1.375	0.0	482.9	3944
8640 min Summer	1.191	0.0	499.5	4584
10080 min Summer	1.055	0.0	513.7	5248

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey S051 0HE

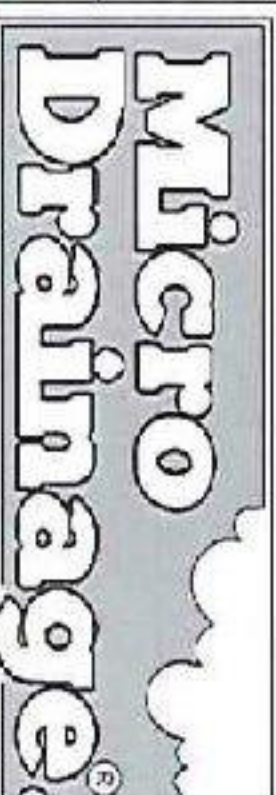
Road 1C Porous Paving

Date March 2017

Designed by KAM

File 1B-1C Cascade.casx

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Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 1C.srx

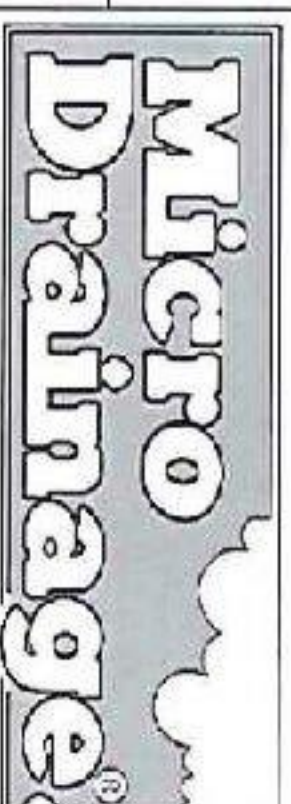
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	8.479	0.319	0.0	3.3	3.3	56.4	O K
30 min Winter	8.581	0.421	0.0	3.3	3.3	79.1	O K
60 min Winter	8.693	0.533	0.0	3.3	3.3	104.3	O K
120 min Winter	8.814	0.654	0.0	3.3	3.3	131.4	O K
180 min Winter	8.885	0.725	0.0	3.3	3.3	147.5	O K
240 min Winter	8.934	0.774	0.0	3.3	3.3	158.4	O K
360 min Winter	9.006	0.846	0.0	3.3	3.3	174.7	O K
480 min Winter	9.057	0.897	0.0	3.3	3.3	185.9	O K
600 min Winter	9.093	0.933	0.0	3.3	3.3	194.2	Flood Risk
720 min Winter	9.121	0.961	0.0	3.3	3.3	200.4	Flood Risk
960 min Winter	9.138	0.978	0.0	3.3	3.3	204.2	Flood Risk
1440 min Winter	9.074	0.914	0.0	3.3	3.3	189.7	Flood Risk
2160 min Winter	8.943	0.783	0.0	3.3	3.3	160.4	O K
2880 min Winter	8.811	0.651	0.0	3.3	3.3	130.8	O K
4320 min Winter	8.582	0.422	0.0	3.3	3.3	79.5	O K
5760 min Winter	8.419	0.259	0.0	3.3	3.3	42.9	O K
7200 min Winter	8.351	0.191	0.0	3.1	3.1	27.6	O K
8640 min Winter	8.327	0.167	0.0	2.8	2.8	22.1	O K
10080 min Winter	8.308	0.148	0.0	2.4	2.4	18.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Winter	119.147	0.0	96.5	164			
30 min Winter	80.259	0.0	131.9	233			
60 min Winter	51.576	0.0	171.1	310			
120 min Winter	31.966	0.0	213.3	400			
180 min Winter	23.783	0.0	238.6	458			
240 min Winter	19.132	0.0	256.2	504			
360 min Winter	14.103	0.0	263.7	582			
480 min Winter	11.339	0.0	304.3	652			
600 min Winter	9.565	0.0	320.9	716			
720 min Winter	8.320	0.0	335.0	778			
960 min Winter	6.669	0.0	358.0	928			
1440 min Winter	4.874	0.0	392.1	1128			
2160 min Winter	3.554	0.0	428.0	1544			
2880 min Winter	2.836	0.0	454.5	1952			
4320 min Winter	2.060	0.0	493.0	2692			
5760 min Winter	1.640	0.0	521.0	3304			
7200 min Winter	1.375	0.0	543.5	3832			
8640 min Winter	1.191	0.0	562.6	4560			
10080 min Winter	1.055	0.0	578.9	5264			

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Norndean Road
 Emsworth
 Road 1C Porous Paving

Date March 2017
 File 1B-1C Cascade.casx

Designed by KAM
 Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Road 1C.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)	19.600	Shortest Storm (mins)	15
Ratio R	0.345	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.184

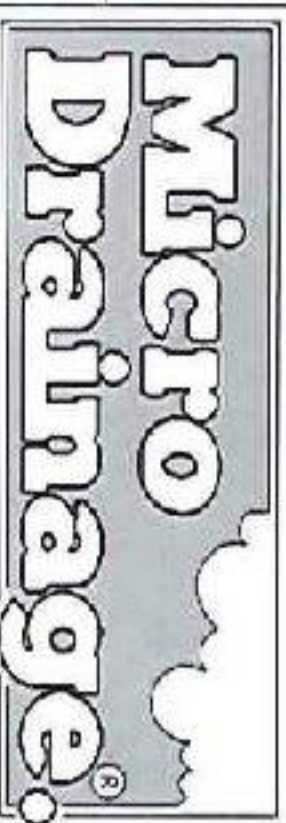
Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: To:		From: To:		From: To:	
0 5	0.000	5 10	0.092	10 15	0.092

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HF

Horndean Road
 Emsworth
 Road 1C Porous Paving

Date March 2017
 File 1B-1C Cascade.casx

Designed by KAM
 Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Model Details for Road 1C.srcx

Storage is Online Cover Level (m) 9.360

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.5
Membrane Percolation (mm/hr)	1000	Length (m)	136.0
Max Percolation (l/s)	207.8	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.160	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 8.160

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	3.3000	1.800	3.3000	3.400	3.3000	5.000	3.3000
0.400	3.3000	2.000	3.3000	3.600	3.3000	5.200	3.3000
0.600	3.3000	2.200	3.3000	3.800	3.3000	5.400	3.3000
0.800	3.3000	2.400	3.3000	4.000	3.3000	5.600	3.3000
1.000	3.3000	2.600	3.3000	4.200	3.3000	5.800	3.3000
1.200	3.3000	2.800	3.3000	4.400	3.3000	6.000	3.3000
1.400	3.3000	3.000	3.3000	4.600	3.3000		
1.600	3.3000	3.200	3.3000	4.800	3.3000		

Appendix C

Road 8-Road 9 – Drainage Calculations

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey S051 OHE

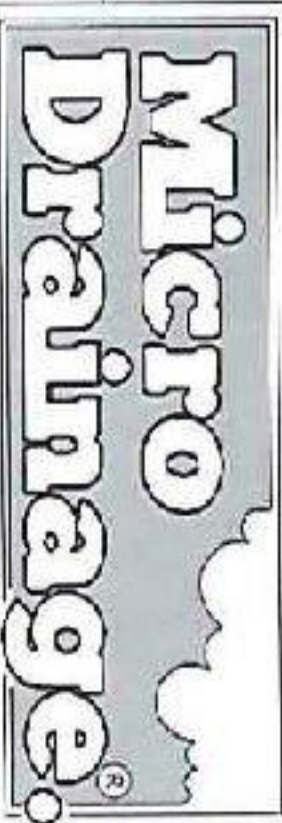
Road 8 Porcous Paving

Date March 2017

Designed by KAM

File 8-9 Cascade.casx

Checked by



Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 8.srxx

Upstream Outflow To Overflow To Structures

(None) Road 9.srxx (None)

Half Drain Time : 330 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	8.592	0.432	0.0	4.0	4.0	65.1	O K
30 min Summer	8.719	0.559	0.0	4.0	4.0	87.5	O K
60 min Summer	8.844	0.684	0.0	4.0	4.0	109.5	O K
120 min Summer	8.949	0.789	0.0	4.0	4.0	127.9	O K
180 min Summer	8.985	0.825	0.0	4.0	4.0	134.3	O K
240 min Summer	8.992	0.832	0.0	4.0	4.0	135.4	O K
360 min Summer	8.984	0.824	0.0	4.0	4.0	134.1	O K
480 min Summer	8.969	0.809	0.0	4.0	4.0	131.4	O K
600 min Summer	8.950	0.790	0.0	4.0	4.0	128.0	O K
720 min Summer	8.928	0.768	0.0	4.0	4.0	124.3	O K
960 min Summer	8.884	0.724	0.0	4.0	4.0	116.4	O K
1440 min Summer	8.794	0.634	0.0	4.0	4.0	100.7	O K
2160 min Summer	8.672	0.512	0.0	4.0	4.0	79.2	O K
2880 min Summer	8.568	0.408	0.0	4.0	4.0	61.0	O K
4320 min Summer	8.422	0.262	0.0	4.0	4.0	35.3	O K
5760 min Summer	8.354	0.194	0.0	3.9	3.9	23.3	O K
7200 min Summer	8.327	0.167	0.0	3.3	3.3	18.6	O K
8640 min Summer	8.307	0.147	0.0	2.9	2.9	15.2	O K
10080 min Summer	8.292	0.132	0.0	2.6	2.6	12.5	O K

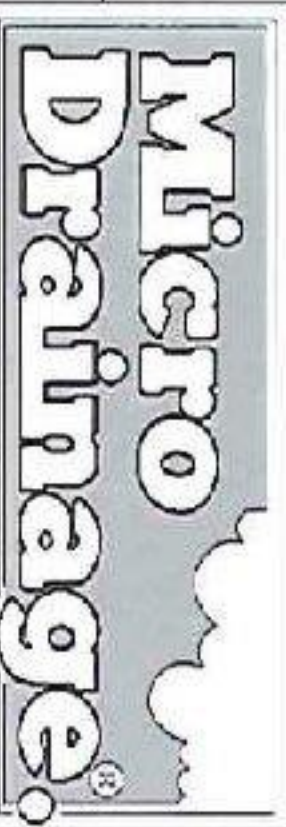
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	119.147	0.0	69.0	29
30 min Summer	80.259	0.0	93.9	43
60 min Summer	51.576	0.0	121.5	72
120 min Summer	31.966	0.0	151.3	130
180 min Summer	23.783	0.0	169.1	188
240 min Summer	19.132	0.0	181.6	246
360 min Summer	14.103	0.0	201.0	308
480 min Summer	11.339	0.0	215.5	370
600 min Summer	9.565	0.0	227.3	436
720 min Summer	8.320	0.0	237.3	504
960 min Summer	6.669	0.0	253.6	640
1440 min Summer	4.874	0.0	277.8	910
2160 min Summer	3.554	0.0	303.4	1300
2880 min Summer	2.836	0.0	322.3	1656
4320 min Summer	2.060	0.0	350.1	2340
5760 min Summer	1.640	0.0	370.3	3000
7200 min Summer	1.375	0.0	386.8	3688
8640 min Summer	1.191	0.0	400.7	4416
10080 min Summer	1.055	0.0	412.8	5152

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HF

Horndean Road
 Emsworth
 Road 8 Porous Paving

Date March 2017
 File 8-9 Cascade.casx

Designed by KMM
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Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 8.srccx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	8.640	0.480	0.0	4.0	4.0	73.6	O K
30 min Winter	8.785	0.625	0.0	4.0	4.0	99.0	O K
60 min Winter	8.929	0.769	0.0	4.0	4.0	124.3	O K
120 min Winter	9.054	0.894	0.0	4.0	4.0	146.3	O K
180 min Winter	9.102	0.942	0.0	4.0	4.0	154.8	Flood Risk
240 min Winter	9.117	0.957	0.0	4.0	4.0	157.4	Flood Risk
360 min Winter	9.113	0.953	0.0	4.0	4.0	156.8	Flood Risk
480 min Winter	9.089	0.929	0.0	4.0	4.0	152.5	Flood Risk
600 min Winter	9.064	0.904	0.0	4.0	4.0	148.0	Flood Risk
720 min Winter	9.034	0.874	0.0	4.0	4.0	142.8	O K
960 min Winter	8.967	0.807	0.0	4.0	4.0	131.0	O K
1440 min Winter	8.829	0.669	0.0	4.0	4.0	106.8	O K
2160 min Winter	8.640	0.480	0.0	4.0	4.0	73.7	O K
2880 min Winter	8.489	0.329	0.0	4.0	4.0	47.1	O K
4320 min Winter	8.347	0.187	0.0	3.7	3.7	22.1	O K
5760 min Winter	8.311	0.151	0.0	3.0	3.0	15.8	O K
7200 min Winter	8.287	0.127	0.0	2.5	2.5	11.7	O K
8640 min Winter	8.271	0.111	0.0	2.2	2.2	8.9	O K
10080 min Winter	8.259	0.099	0.0	2.0	2.0	7.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
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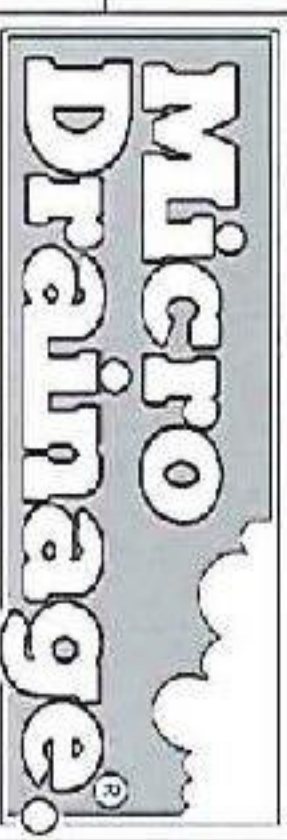
15 min Winter	119.147	0.0	77.6	29
30 min Winter	80.259	0.0	105.6	43
60 min Winter	51.576	0.0	136.5	70
120 min Winter	31.966	0.0	169.8	128
180 min Winter	23.783	0.0	189.8	184
240 min Winter	19.132	0.0	203.8	240
360 min Winter	14.103	0.0	225.5	348
480 min Winter	11.339	0.0	241.8	396
600 min Winter	9.565	0.0	255.1	470
720 min Winter	8.320	0.0	266.2	548
960 min Winter	6.669	0.0	284.5	698
1440 min Winter	4.874	0.0	311.7	986
2160 min Winter	3.554	0.0	340.5	1372
2880 min Winter	2.836	0.0	361.8	1716
4320 min Winter	2.060	0.0	393.1	2296
5760 min Winter	1.640	0.0	415.9	3000
7200 min Winter	1.375	0.0	434.6	3752
8640 min Winter	1.191	0.0	450.4	4416
10080 min Winter	1.055	0.0	464.1	5144

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

Horndean Road
 Emsworth
 Road 8 Porous Paving

Date March 2017
 File 8-9 Cascade.casx

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Micro Drainage

Source Control 2013.1.1

Cascade Rainfall Details for Road 8.srck

Rainfall Model		FSR	Winter Storms	
Return Period (years)		100	Cv (Summer)	0.750
	Region England and Wales		Cv (Winter)	0.840
M5-60 (mm)		19.600	Shortest Storm (mins)	15
Ratio R		0.345	Longest Storm (mins)	10080
Summer Storms		Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.322

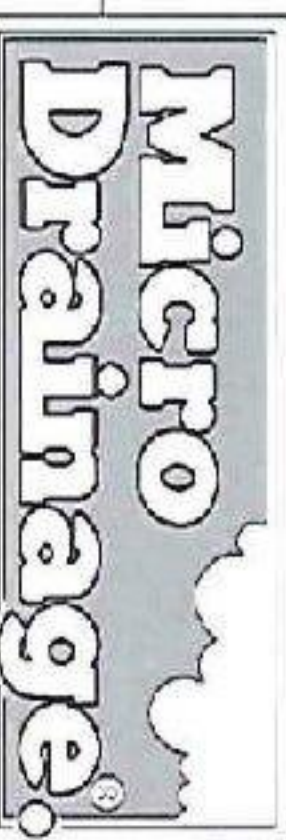
Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: To:		From: To:		From: To:	
0 5	0.000	5 10	0.161	10 15	0.161

Lone Barn Studios
 Stanbridge Lane
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Horndean Road
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Cascade Model Details for Road 8.srxx

Storage is Online Cover Level (m) 9.360

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	122.0
Max Percolation (l/s)	162.7	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	8.160	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 8.160

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	4.0000	1.800	4.0000	3.400	4.0000	5.000	4.0000
0.400	4.0000	2.000	4.0000	3.600	4.0000	5.200	4.0000
0.600	4.0000	2.200	4.0000	3.800	4.0000	5.400	4.0000
0.800	4.0000	2.400	4.0000	4.000	4.0000	5.600	4.0000
1.000	4.0000	2.600	4.0000	4.200	4.0000	5.800	4.0000
1.200	4.0000	2.800	4.0000	4.400	4.0000	6.000	4.0000
1.400	4.0000	3.000	4.0000	4.600	4.0000		
1.600	4.0000	3.200	4.0000	4.800	4.0000		

Lone Barn Studios
 Stanbridge Lane
 Romsey SO51 0HE

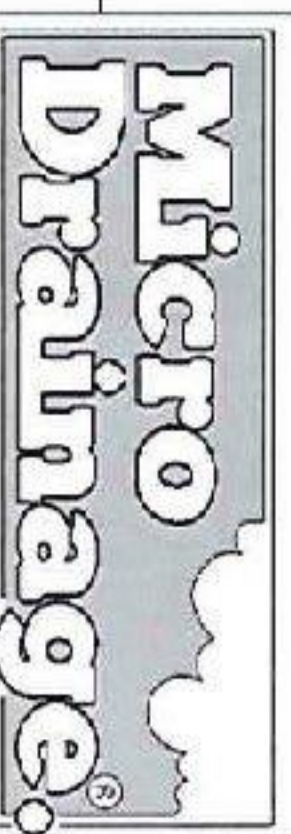
Hordean Road
 Emsworth
 Road 9 Porous Paving

Date March 2017

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Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 9.srcx

Upstream Outflow To Overflow To
 Structures

Road 8.srcx (None) (None)

Half Drain Time : 461 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	8.301	0.501	0.0	3.4	3.4	80.0	O K
30 min Summer	8.341	0.541	0.0	4.3	4.3	87.3	O K
60 min Summer	8.477	0.677	0.0	4.8	4.8	112.3	O K
120 min Summer	8.635	0.835	0.0	4.8	4.8	141.1	O K
180 min Summer	8.733	0.933	0.0	4.8	4.8	159.0	O K
240 min Summer	8.802	1.002	0.0	4.8	4.8	171.7	O K
360 min Summer	8.908	1.108	0.0	4.8	4.8	191.0	O K
480 min Summer	8.981	1.181	0.0	4.8	4.8	204.4	O K
600 min Summer	9.035	1.235	0.0	4.8	4.8	214.3	O K
720 min Summer	9.074	1.274	0.0	4.8	4.8	221.5	Flood Risk
960 min Summer	9.124	1.324	0.0	4.8	4.8	230.5	Flood Risk
1440 min Summer	9.152	1.352	0.0	4.8	4.8	235.7	Flood Risk
2160 min Summer	9.116	1.318	0.0	4.8	4.8	229.5	Flood Risk
2880 min Summer	9.066	1.266	0.0	4.8	4.8	220.0	Flood Risk
4320 min Summer	8.915	1.115	0.0	4.8	4.8	192.2	O K
5760 min Summer	8.712	0.912	0.0	4.8	4.8	155.2	O K
7200 min Summer	8.545	0.745	0.0	4.8	4.8	124.7	O K
8640 min Summer	8.431	0.631	0.0	4.8	4.8	103.8	O K
10080 min Summer	8.366	0.566	0.0	4.8	4.8	92.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	119.147	0.0	76.5	223			
30 min Summer	80.259	0.0	123.9	45			
60 min Summer	51.576	0.0	176.4	74			
120 min Summer	31.966	0.0	232.9	134			
180 min Summer	23.783	0.0	266.8	194			
240 min Summer	19.132	0.0	290.4	252			
360 min Summer	14.103	0.0	327.3	372			
480 min Summer	11.339	0.0	355.0	492			
600 min Summer	9.565	0.0	377.3	610			
720 min Summer	8.320	0.0	396.2	730			
960 min Summer	6.669	0.0	427.2	968			
1440 min Summer	4.874	0.0	473.0	1446			
2160 min Summer	3.554	0.0	521.6	1740			
2880 min Summer	2.836	0.0	557.5	2032			
4320 min Summer	2.060	0.0	610.0	2652			
5760 min Summer	1.640	0.0	648.2	3336			
7200 min Summer	1.375	0.0	679.2	3992			
8640 min Summer	1.191	0.0	705.5	4632			
10080 min Summer	1.055	0.0	728.2	5248			

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

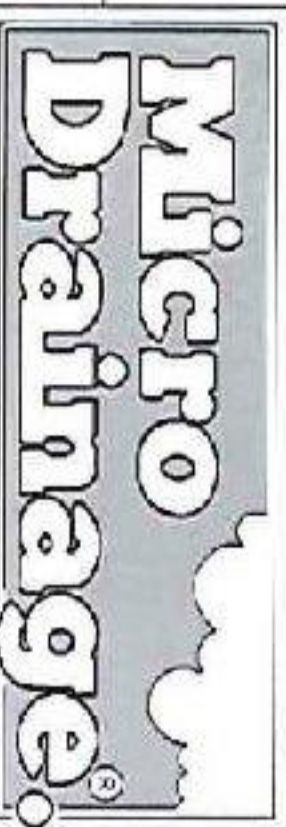
Road 9 Porous Paving

Dale March 2017

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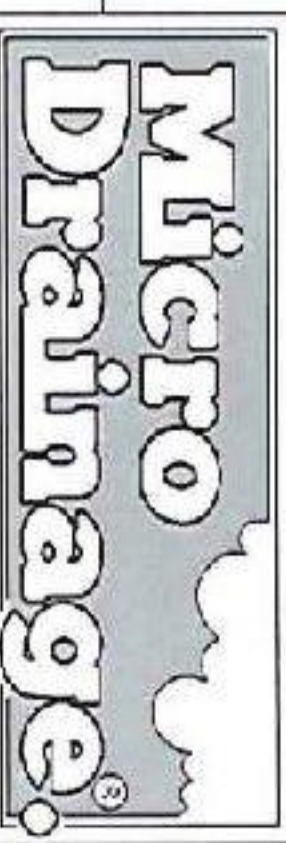
Micro Drainage

Source Control 2013.1.1

Cascade Summary of Results for Road 9.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	8.314	0.514	0.0	3.7	3.7	82.4	O K
30 min Winter	8.394	0.594	0.0	4.8	4.8	97.1	O K
60 min Winter	8.551	0.751	0.0	4.8	4.8	125.7	O K
120 min Winter	8.725	0.925	0.0	4.8	4.8	157.6	O K
180 min Winter	8.832	1.032	0.0	4.8	4.8	177.1	O K
240 min Winter	8.907	1.107	0.0	4.8	4.8	190.8	O K
360 min Winter	9.020	1.220	0.0	4.8	4.8	211.5	O K
480 min Winter	9.100	1.300	0.0	4.8	4.8	226.2	Flood Risk
600 min Winter	9.160	1.360	0.0	4.8	4.8	237.1	Flood Risk
720 min Winter	9.206	1.406	0.0	4.8	4.8	245.4	Flood Risk
960 min Winter	9.266	1.466	0.0	4.8	4.8	256.5	Flood Risk
1440 min Winter	9.313	1.513	0.0	4.8	4.8	265.1	Flood Risk
2160 min Winter	9.273	1.473	0.0	4.8	4.8	257.7	Flood Risk
2880 min Winter	9.184	1.384	0.0	4.8	4.8	241.5	Flood Risk
4320 min Winter	8.832	1.032	0.0	4.8	4.8	177.1	O K
5760 min Winter	8.520	0.720	0.0	4.8	4.8	120.1	O K
7200 min Winter	8.360	0.560	0.0	4.8	4.8	90.8	O K
8640 min Winter	8.334	0.534	0.0	4.2	4.2	86.1	O K
10080 min Winter	8.315	0.515	0.0	3.7	3.7	82.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Winter	119.147	0.0	92.9	246			
30 min Winter	80.259	0.0	146.0	44			
60 min Winter	51.576	0.0	204.8	74			
120 min Winter	31.966	0.0	268.1	132			
180 min Winter	23.783	0.0	306.1	190			
240 min Winter	19.132	0.0	332.6	250			
360 min Winter	14.103	0.0	373.9	366			
480 min Winter	11.339	0.0	404.9	484			
600 min Winter	9.565	0.0	430.0	600			
720 min Winter	8.320	0.0	451.2	718			
960 min Winter	6.669	0.0	485.9	950			
1440 min Winter	4.874	0.0	537.3	1406			
2160 min Winter	3.554	0.0	592.1	1828			
2880 min Winter	2.836	0.0	632.5	2096			
4320 min Winter	2.060	0.0	691.7	2752			
5760 min Winter	1.640	0.0	734.9	3392			
7200 min Winter	1.375	0.0	770.1	3800			
8640 min Winter	1.191	0.0	800.0	4504			
10080 min Winter	1.055	0.0	825.8	5216			

Lone Barn Studios	Horndean Road
Stanbridge Lane	Fmsworth
Romsey SO51 0HE	Road 9 Porous Paving
Date March 2017	Designed by KAM
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Source Control 2013.1.1

Cascade Rainfall Details for Road 9.srnx

Rainfall Model	ESR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
	Region England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.600	Shortest Storm (mins)	15
Ratio R	0.345	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.290

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 5	0.000	5 10	0.145	10 15	0.145

Lone Barn Studios

Horndean Road

Stanbridge Lane

Emsworth

Romsey SO51 0HE

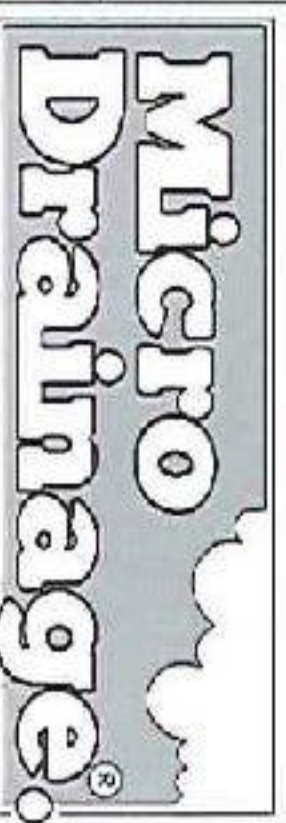
Road 9 Porous Paving

Date March 2017

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Cascade Model Details for Road 9.sicx

Storage is Online Cover Level (m) 9.360

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	127.0
Max Percolation (l/s)	169.3	Slope (1:X)	1000.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	7.800	Cap Volume Depth (m)	0.000

Depth/Flow Relationship Outflow Control

Invert Level (m) 8.160

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	4.8000	1.800	4.8000	3.400	4.8000	5.000	4.8000
0.400	4.8000	2.000	4.8000	3.600	4.8000	5.200	4.8000
0.600	4.8000	2.200	4.8000	3.800	4.8000	5.400	4.8000
0.800	4.8000	2.400	4.8000	4.000	4.8000	5.600	4.8000
1.000	4.8000	2.600	4.8000	4.200	4.8000	5.800	4.8000
1.200	4.8000	2.800	4.8000	4.400	4.8000	6.000	4.8000
1.400	4.8000	3.000	4.8000	4.600	4.8000		
1.600	4.8000	3.200	4.8000	4.800	4.8000		