



Clarke Nicholls Marcel		Page 0
Glen House 22-24 Glenthorne Road Hammersmith W6 ONG	150 Holborn Main Roof	
Date 06/09/2016 16:21 File 1 IN 100 YEAR MAIN ROO...	Designed by Alan Yan Checked by Mark Stanton	
Micro Drainage	Source Control 2015.1	

Summary of Results for 100 year Return Period

Half Drain Time : 286 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.031	0.031	0.0	0.6	0.6	23.7	O K
30 min Summer	0.040	0.040	0.0	1.0	1.0	30.1	O K
60 min Summer	0.047	0.047	0.0	1.4	1.4	35.8	O K
120 min Summer	0.053	0.053	0.0	1.7	1.7	39.7	O K
180 min Summer	0.054	0.054	0.0	1.8	1.8	40.6	O K
240 min Summer	0.054	0.054	0.0	1.8	1.8	41.0	O K
360 min Summer	0.055	0.055	0.0	1.9	1.9	41.4	O K
480 min Summer	0.055	0.055	0.0	1.9	1.9	41.3	O K
600 min Summer	0.054	0.054	0.0	1.8	1.8	41.1	O K
720 min Summer	0.054	0.054	0.0	1.8	1.8	40.7	O K
960 min Summer	0.053	0.053	0.0	1.7	1.7	39.7	O K
1440 min Summer	0.050	0.050	0.0	1.6	1.6	37.6	O K
2160 min Summer	0.046	0.046	0.0	1.4	1.4	34.8	O K
2880 min Summer	0.043	0.043	0.0	1.2	1.2	32.5	O K
4320 min Summer	0.038	0.038	0.0	1.0	1.0	29.1	O K
5760 min Summer	0.035	0.035	0.0	0.8	0.8	26.5	O K
7200 min Summer	0.033	0.033	0.0	0.7	0.7	24.7	O K
8640 min Summer	0.031	0.031	0.0	0.6	0.6	23.1	O K
10080 min Summer	0.029	0.029	0.0	0.6	0.6	21.9	O K
15 min Winter	0.035	0.035	0.0	0.8	0.8	26.5	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	104.564	0.0	17.2	26
30 min Summer	67.582	0.0	23.7	40
60 min Summer	41.548	0.0	34.0	68
120 min Summer	24.678	0.0	41.1	122
180 min Summer	17.966	0.0	45.2	162
240 min Summer	14.266	0.0	48.0	190
360 min Summer	10.278	0.0	52.1	254
480 min Summer	8.146	0.0	55.2	322
600 min Summer	6.797	0.0	57.6	390
720 min Summer	5.860	0.0	59.6	458
960 min Summer	4.634	0.0	62.7	590
1440 min Summer	3.324	0.0	67.0	852
2160 min Summer	2.381	0.0	76.0	1232
2880 min Summer	1.878	0.0	79.6	1596
4320 min Summer	1.342	0.0	84.0	2344
5760 min Summer	1.057	0.0	91.7	3072
7200 min Summer	0.878	0.0	94.8	3824
8640 min Summer	0.754	0.0	97.2	4576
10080 min Summer	0.663	0.0	98.6	5248
15 min Winter	104.564	0.0	19.9	26

Clarke Nicholls Marcel		Page 1
Glen House 22-24 Glenthorne Road Hammersmith W6 ONG	150 Holborn Main Roof	
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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.045	0.045	0.0	1.3	1.3	33.7	O K
60 min Winter	0.053	0.053	0.0	1.7	1.7	40.0	O K
120 min Winter	0.059	0.059	0.0	2.1	2.1	44.3	O K
180 min Winter	0.060	0.060	0.0	2.2	2.2	45.2	O K
<b>240 min Winter</b>	<b>0.060</b>	<b>0.060</b>	<b>0.0</b>	<b>2.2</b>	<b>2.2</b>	<b>45.5</b>	<b>Flood Risk</b>
360 min Winter	0.060	0.060	0.0	2.2	2.2	45.4	Flood Risk
480 min Winter	0.059	0.059	0.0	2.2	2.2	44.8	O K
600 min Winter	0.058	0.058	0.0	2.1	2.1	43.9	O K
720 min Winter	0.057	0.057	0.0	2.0	2.0	43.0	O K
960 min Winter	0.055	0.055	0.0	1.9	1.9	41.2	O K
1440 min Winter	0.050	0.050	0.0	1.6	1.6	37.9	O K
2160 min Winter	0.045	0.045	0.0	1.3	1.3	34.1	O K
2880 min Winter	0.041	0.041	0.0	1.1	1.1	31.2	O K
4320 min Winter	0.036	0.036	0.0	0.9	0.9	27.2	O K
5760 min Winter	0.032	0.032	0.0	0.7	0.7	24.5	O K
7200 min Winter	0.030	0.030	0.0	0.6	0.6	22.5	O K
8640 min Winter	0.028	0.028	0.0	0.5	0.5	20.9	O K
10080 min Winter	0.026	0.026	0.0	0.5	0.5	19.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	67.582	0.0	27.2	39
60 min Winter	41.548	0.0	38.6	66
120 min Winter	24.678	0.0	46.5	120
180 min Winter	17.966	0.0	51.1	170
<b>240 min Winter</b>	<b>14.266</b>	<b>0.0</b>	<b>54.3</b>	<b>192</b>
360 min Winter	10.278	0.0	58.9	268
480 min Winter	8.146	0.0	62.3	342
600 min Winter	6.797	0.0	65.0	414
720 min Winter	5.860	0.0	67.3	486
960 min Winter	4.634	0.0	70.9	624
1440 min Winter	3.324	0.0	75.7	894
2160 min Winter	2.381	0.0	85.4	1280
2880 min Winter	1.878	0.0	89.5	1672
4320 min Winter	1.342	0.0	94.6	2420
5760 min Winter	1.057	0.0	102.9	3176
7200 min Winter	0.878	0.0	106.5	3896
8640 min Winter	0.754	0.0	109.2	4664
10080 min Winter	0.663	0.0	110.9	5344

Clarke Nicholls Marcel		Page 2
Glen House 22-24 Glenthorne Road Hammersmith W6 ONG	150 Holborn Main Roof	
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Rainfall Details

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)	20.500	Shortest Storm (mins)	15
Ratio R	0.437	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.123

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.041		0.041		0.041

Clarke Nicholls Marcel		Page 3
Glen House 22-24 Glenthorne Road Hammersmith W6 ONG	150 Holborn Main Roof	
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Model Details

Storage is Online Cover Level (m) 0.085

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	795.0	0.0	0.085	795.0	0.0

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0146-9000-0400-9000  
 Design Head (m) 0.400  
 Design Flow (l/s) 9.0  
 Flush-Flo™ Calculated  
 Objective Minimise upstream storage  
 Diameter (mm) 146  
 Invert Level (m) 0.000  
 Minimum Outlet Pipe Diameter (mm) 225  
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	9.0
Flush-Flo™	0.209	8.9
Kick-Flo®	0.333	8.2
Mean Flow over Head Range	-	6.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	1.200	15.1	3.000	23.3	7.000	35.3
0.200	8.9	1.400	16.2	3.500	25.1	7.500	36.5
0.300	8.6	1.600	17.3	4.000	26.8	8.000	37.7
0.400	9.0	1.800	18.3	4.500	28.2	8.500	38.9
0.500	9.9	2.000	19.2	5.000	29.8	9.000	40.1
0.600	10.8	2.200	20.1	5.500	31.2	9.500	41.2
0.800	12.4	2.400	21.0	6.000	32.6		
1.000	13.8	2.600	21.8	6.500	34.0		