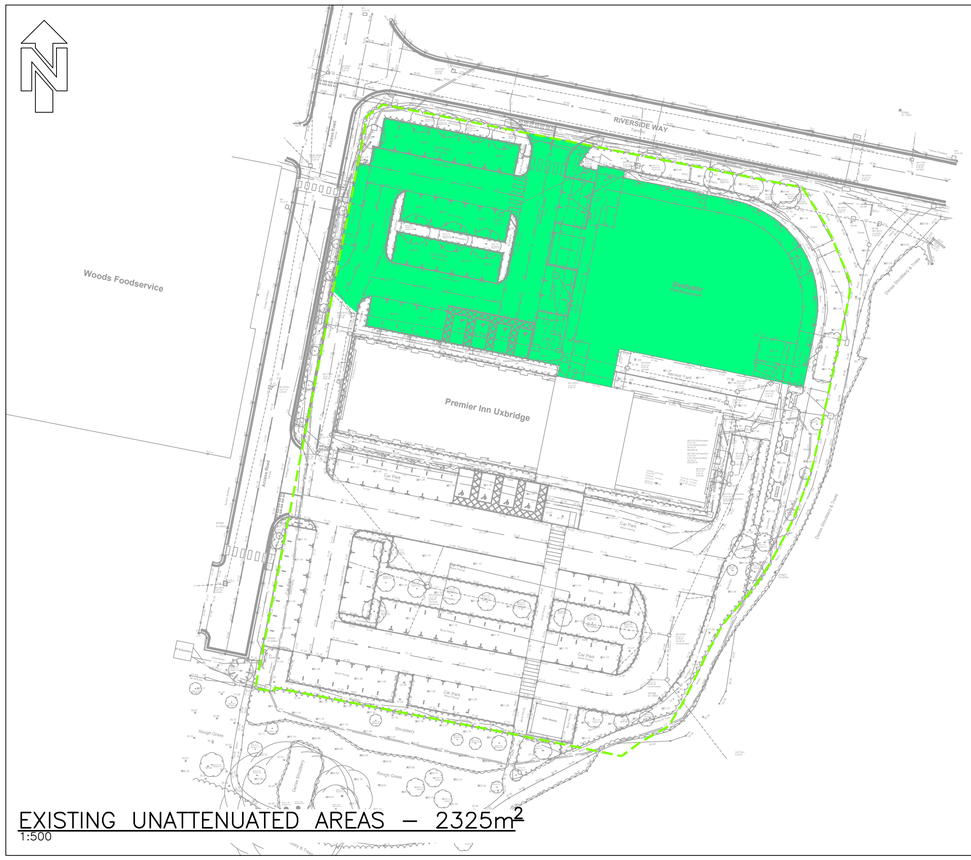
APPENDIX E
AREAS LAYOUT

DO NOT SCALE



EXISTING UNATTENUATED AREAS – 2325m²
1:500

PROPOSED UNATTENUATED AREAS – 2315m²
1:500

EXISTING ATTENUATED AREAS – 3712m²
1:500

PROPOSED ATTENUATED AREAS – 3661m²
1:500

P1	FIRST ISSUE.	PB	01.10.24
MK	REVISION	BY	DATE

DRAWING STATUS

PRELIMINARY

DRAWING TITLE

AREAS LAYOUT

PROJECT

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Drawn	Ch'kd	Scales	Date
PB	AR	AS SHOWN	OCT '24

Purpose of Issue

PLANNING

Project Number	Drawing Number	Revision
P24-0616	SK02	P1

A1

APPENDIX F
DRAINAGE STRATEGY PLAN

DO NOT SCALE

DRAINAGE STRATEGY
1:200

A1

LEGEND

- Surface water drain (150mm 1/150)
- Foul water drain (150mm 1/150)
- Surface water drain to be removed
- Foul water drain to be removed
- Channel drain and trapped outfall unit (CO)
- Trapped road gully (RG)
- Surface water catchpit chamber
- Foul water inspection chamber
- Exceedance flood flow route
- River Colne
- Site boundary

P1	FIRST ISSUE.	PB	01.10.24
MK	REVISION	BY	DATE

DRAWING STATUS

PRELIMINARY

DRAWING TITLE

DRAINAGE STRATEGY

PROJECT

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Drawn	Ch'kd	Scales	Date
PB	AR	AS SHOWN	OCT '24

Purpose of Issue: PLANNING

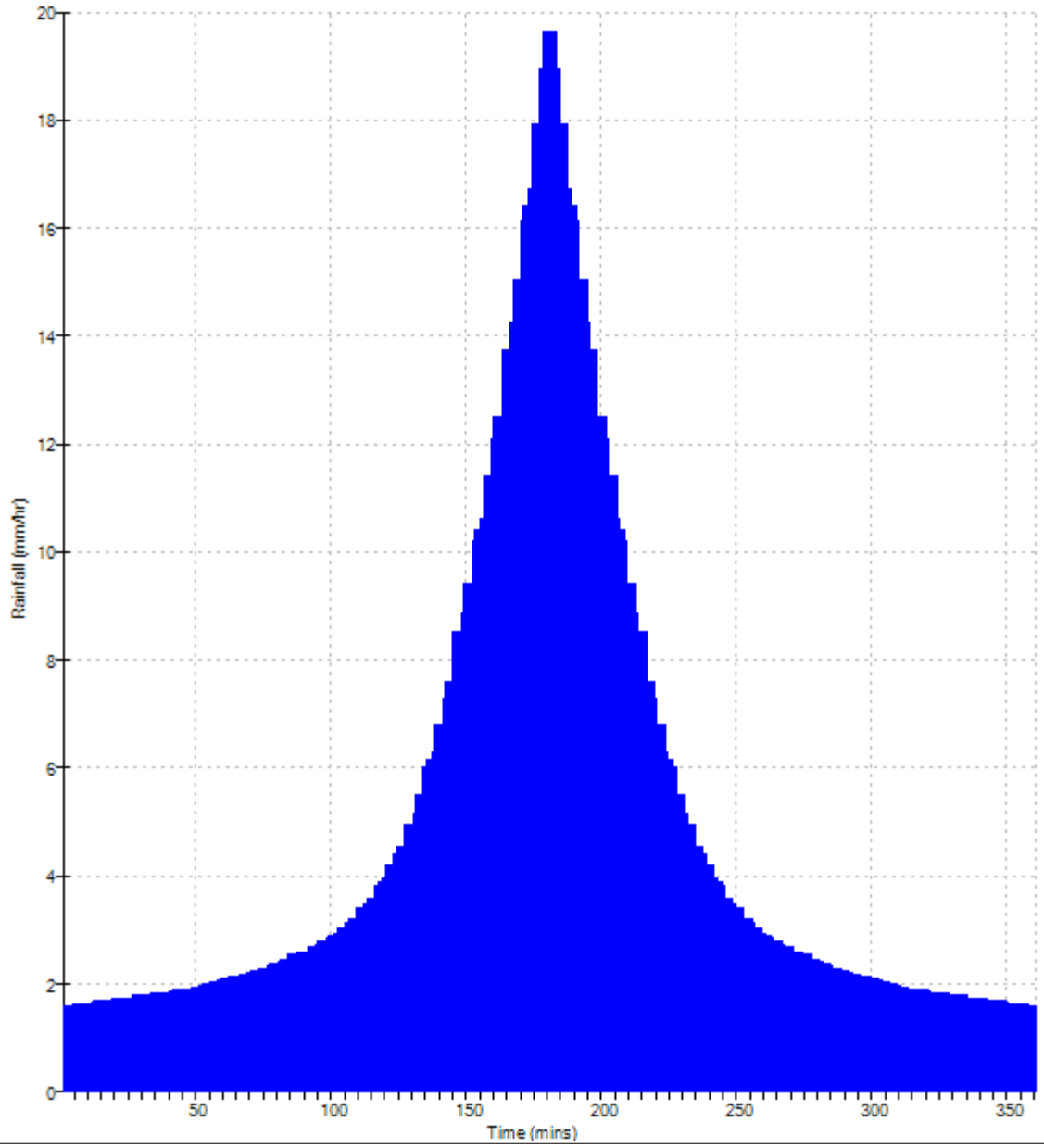
Project Number	Drawing Number	Revision
P24-0616	SK01	P1

APPENDIX G
BROWNFIELD RUNOFF CALCULATIONS

Rainfall profile

Storm duration (mins) 360

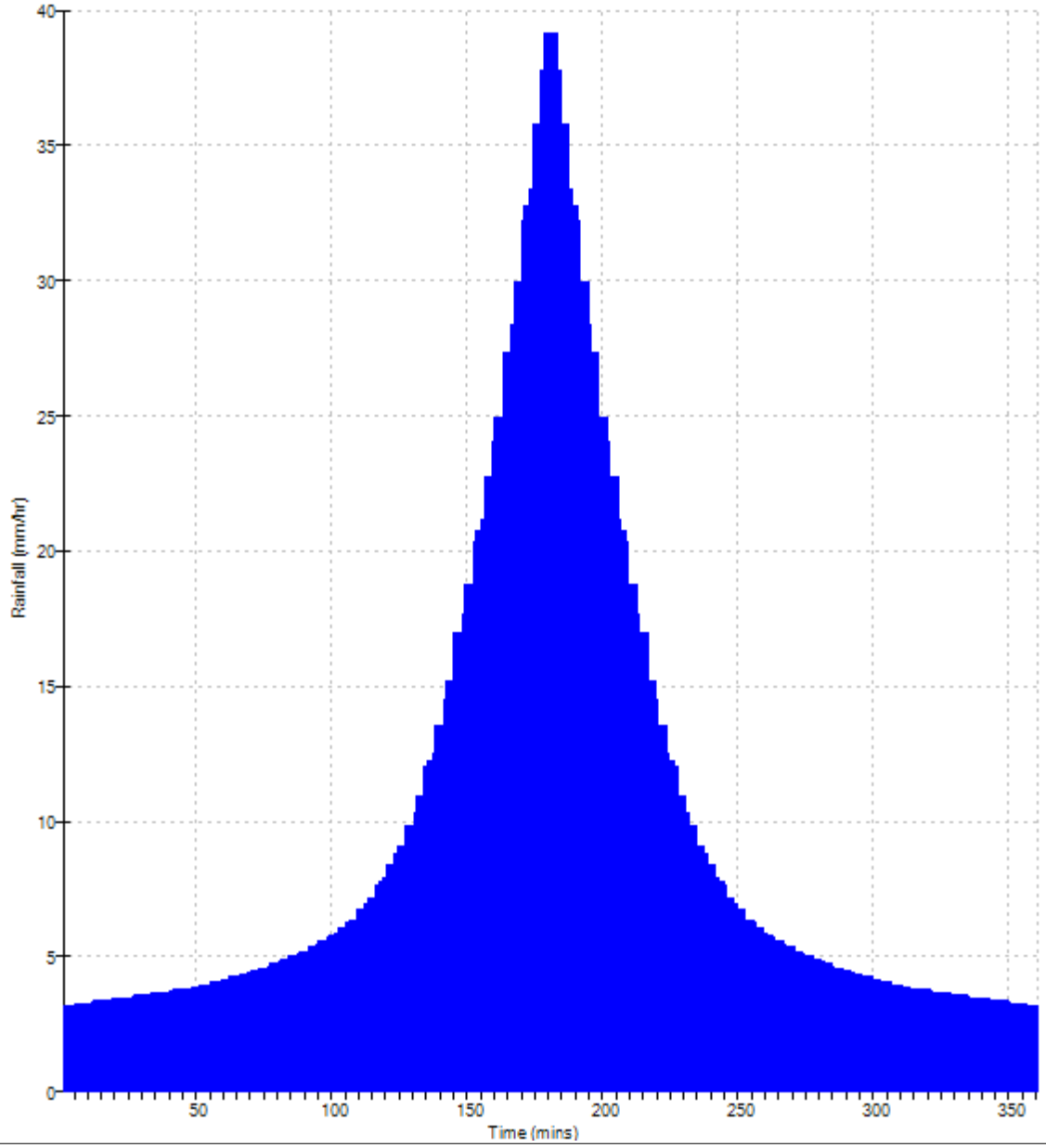
FEH Data	
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Peak Intensity (mm/hr)	19.654
Ave. Intensity (mm/hr)	5.014
Return Period (years)	2.0



Rainfall profile

Storm duration (mins) 360

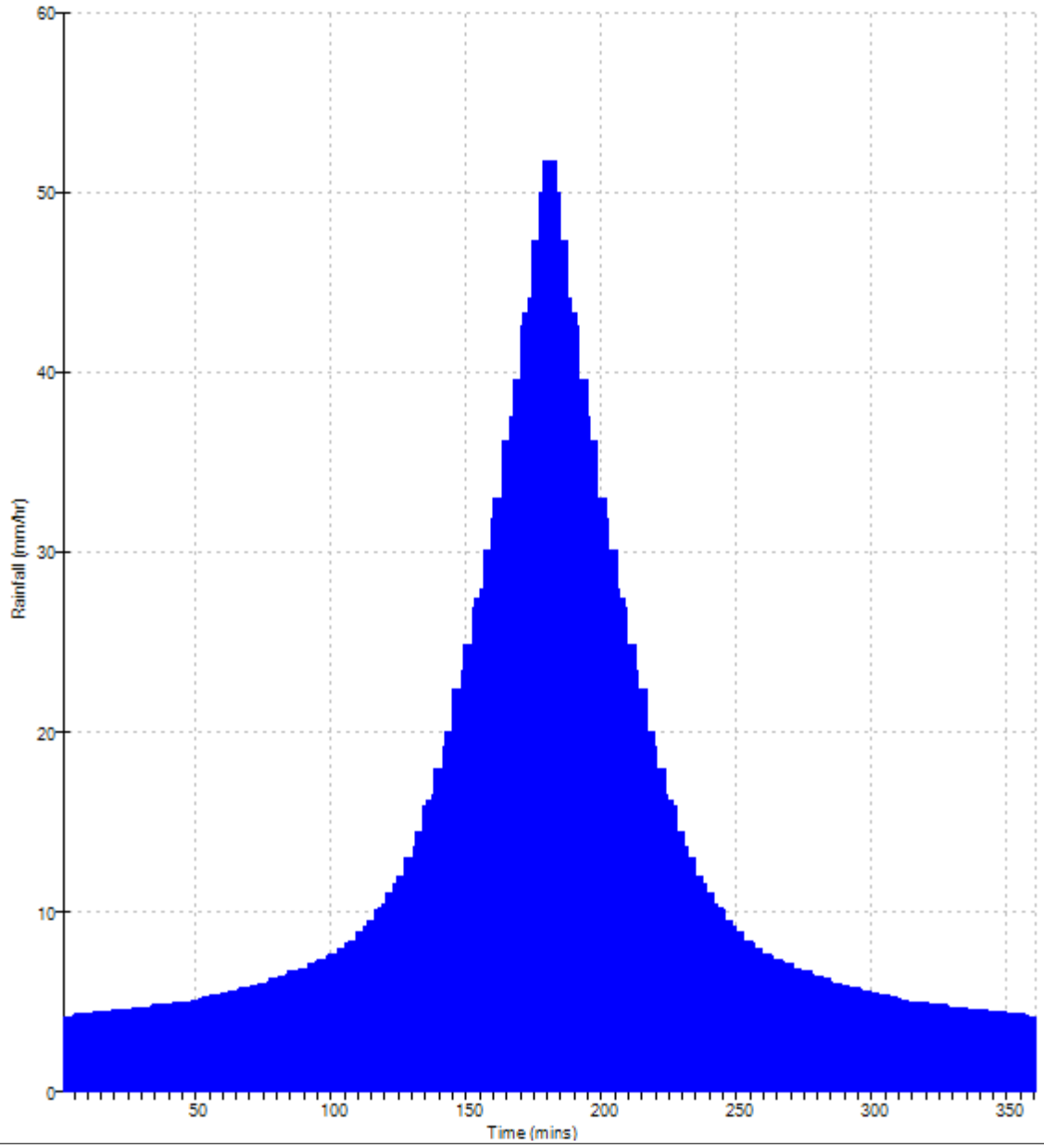
FEH Data	
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Peak Intensity (mm/hr)	39.182
Ave. Intensity (mm/hr)	9.995
Return Period (years)	30.0



Rainfall profile

Storm duration (mins) 360

FEH Data	
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Peak Intensity (mm/hr)	51.798
Ave. Intensity (mm/hr)	13.214
Return Period (years)	100.0



P24-0616 - Premier Inn London (Uxbridge)

Modified Rational Method Runoff Calculations

Peak Runoff Rate = 3.61 x Runoff Volume Coefficient (Cv) x Area (A) x Peak Rainfall Intensity (I_{peak})

Runoff Volume = Runoff Coefficient (C) x Area (A) x Average Rainfall intensity (I_{ave}) x Storm Duration

Existing Unattenuated Area

Return Period	Cv	$I_{(peak)}$ (mm)	$I_{(ave)}$ (mm)	A (Ha)	Peak Runoff Rate (l/s)	Runoff Volume (m^3)
2	0.95	19.654	5.014	0.2325	15.7	66.4
30	0.95	39.182	9.995	0.2325	31.2	132.5
100	0.95	51.798	13.214	0.2325	41.3	175.1
100+40%	0.95	72.517	18.500	0.2325	57.8	245.2

Proposed Unattenuated Area

Return Period	Cv	$I_{(peak)}$ (mm)	$I_{(ave)}$ (mm)	A (Ha)	Peak Runoff Rate (l/s)	Runoff Volume (m^3)
2	0.95	19.654	5.014	0.2315	15.6	66.2
30	0.95	39.182	9.995	0.2315	31.1	131.9
100	0.95	51.798	13.214	0.2315	41.1	174.4
100+40%	0.95	72.517	18.500	0.2315	57.6	244.1

APPENDIX H
EXISTING ATTENUATION MICRODRAINAGE RESULTS

Summary of Results for 2 year Return Period

Half Drain Time : 7 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	29.648	0.098	0.0	24.1	24.1	16.8	O K
30 min Summer	29.647	0.097	0.0	24.1	24.1	16.5	O K
60 min Summer	29.632	0.082	0.0	22.9	22.9	14.1	O K
120 min Summer	29.627	0.077	0.0	22.3	22.3	13.1	O K
180 min Summer	29.612	0.062	0.0	20.6	20.6	10.5	O K
240 min Summer	29.598	0.048	0.0	18.9	18.9	8.2	O K
360 min Summer	29.576	0.026	0.0	16.0	16.0	4.5	O K
480 min Summer	29.562	0.012	0.0	13.8	13.8	2.0	O K
600 min Summer	29.553	0.003	0.0	12.5	12.5	0.5	O K
720 min Summer	29.550	0.000	0.0	11.2	11.2	0.0	O K
960 min Summer	29.550	0.000	0.0	8.9	8.9	0.0	O K
1440 min Summer	29.550	0.000	0.0	6.4	6.4	0.0	O K
2160 min Summer	29.550	0.000	0.0	4.6	4.6	0.0	O K
2880 min Summer	29.550	0.000	0.0	3.7	3.7	0.0	O K
4320 min Summer	29.550	0.000	0.0	2.7	2.7	0.0	O K
5760 min Summer	29.550	0.000	0.0	2.2	2.2	0.0	O K
7200 min Summer	29.550	0.000	0.0	1.9	1.9	0.0	O K
8640 min Summer	29.550	0.000	0.0	1.7	1.7	0.0	O K
10080 min Summer	29.550	0.000	0.0	1.6	1.6	0.0	O K
15 min Winter	29.647	0.097	0.0	24.1	24.1	16.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	35.969	0.0	31.9	13
30 min Summer	22.980	0.0	40.1	22
60 min Summer	14.223	0.0	49.6	38
120 min Summer	10.186	0.0	72.0	70
180 min Summer	8.031	0.0	85.1	102
240 min Summer	6.670	0.0	93.9	132
360 min Summer	5.014	0.0	105.8	192
480 min Summer	4.032	0.0	113.7	250
600 min Summer	3.386	0.0	119.3	308
720 min Summer	2.928	0.0	123.8	0
960 min Summer	2.319	0.0	130.8	0
1440 min Summer	1.662	0.0	140.6	0
2160 min Summer	1.196	0.0	151.8	0
2880 min Summer	0.954	0.0	161.4	0
4320 min Summer	0.705	0.0	178.8	0
5760 min Summer	0.576	0.0	194.9	0
7200 min Summer	0.498	0.0	210.5	0
8640 min Summer	0.445	0.0	225.8	0
10080 min Summer	0.407	0.0	240.8	0
15 min Winter	35.969	0.0	31.9	14

Summary of Results for 2 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	29.641	0.091	0.0	23.8	23.8	15.5	O K
60 min Winter	29.618	0.068	0.0	21.4	21.4	11.7	O K
120 min Winter	29.602	0.052	0.0	19.5	19.5	8.9	O K
180 min Winter	29.584	0.034	0.0	17.1	17.1	5.8	O K
240 min Winter	29.570	0.020	0.0	15.0	15.0	3.3	O K
360 min Winter	29.551	0.001	0.0	12.2	12.2	0.2	O K
480 min Winter	29.550	0.000	0.0	10.0	10.0	0.0	O K
600 min Winter	29.550	0.000	0.0	8.4	8.4	0.0	O K
720 min Winter	29.550	0.000	0.0	7.2	7.2	0.0	O K
960 min Winter	29.550	0.000	0.0	5.7	5.7	0.0	O K
1440 min Winter	29.550	0.000	0.0	4.1	4.1	0.0	O K
2160 min Winter	29.550	0.000	0.0	3.0	3.0	0.0	O K
2880 min Winter	29.550	0.000	0.0	2.4	2.4	0.0	O K
4320 min Winter	29.550	0.000	0.0	1.7	1.7	0.0	O K
5760 min Winter	29.550	0.000	0.0	1.4	1.4	0.0	O K
7200 min Winter	29.550	0.000	0.0	1.2	1.2	0.0	O K
8640 min Winter	29.550	0.000	0.0	1.1	1.1	0.0	O K
10080 min Winter	29.550	0.000	0.0	1.0	1.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	22.980	0.0	40.1	23
60 min Winter	14.223	0.0	49.5	40
120 min Winter	10.186	0.0	71.6	72
180 min Winter	8.031	0.0	84.6	104
240 min Winter	6.670	0.0	93.9	134
360 min Winter	5.014	0.0	106.0	188
480 min Winter	4.032	0.0	113.7	0
600 min Winter	3.386	0.0	119.4	0
720 min Winter	2.928	0.0	123.8	0
960 min Winter	2.319	0.0	130.8	0
1440 min Winter	1.662	0.0	140.6	0
2160 min Winter	1.196	0.0	151.8	0
2880 min Winter	0.954	0.0	161.4	0
4320 min Winter	0.705	0.0	178.8	0
5760 min Winter	0.576	0.0	194.9	0
7200 min Winter	0.498	0.0	210.5	0
8640 min Winter	0.445	0.0	225.8	0
10080 min Winter	0.407	0.0	240.8	0

Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.371

Time (mins) From:	To:	Area (ha)
0	4	0.371

Model Details

Storage is Online Cover Level (m) 31.020

Cellular Storage Structure

Invert Level (m) 29.550 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	180.0	180.0	0.801	0.0	226.4
0.800	180.0	226.4			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0205-4000-0930-4000
Design Head (m)	0.930
Design Flow (l/s)	40.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	205
Invert Level (m)	29.420
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.930	40.0
Flush-Flo™	0.240	24.2
Kick-Flo®	0.306	23.5
Mean Flow over Head Range	-	26.5

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	7.7	1.200	45.2	3.000	70.5	7.000	106.5
0.200	21.6	1.400	48.7	3.500	75.9	7.500	110.1
0.300	23.6	1.600	52.0	4.000	81.0	8.000	113.7
0.400	26.7	1.800	55.0	4.500	85.8	8.500	117.1
0.500	29.7	2.000	57.9	5.000	90.3	9.000	120.4
0.600	32.4	2.200	60.6	5.500	94.6	9.500	123.0
0.800	37.2	2.400	63.2	6.000	98.7		
1.000	41.4	2.600	65.7	6.500	102.7		

Summary of Results for 30 year Return Period

Half Drain Time : 23 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	29.885	0.335	0.0	28.7	28.7	57.2	O K
30 min Summer	29.921	0.371	0.0	29.7	29.7	63.4	O K
60 min Summer	29.911	0.361	0.0	29.5	29.5	61.7	O K
120 min Summer	29.884	0.334	0.0	28.7	28.7	57.1	O K
180 min Summer	29.840	0.290	0.0	27.3	27.3	49.6	O K
240 min Summer	29.795	0.245	0.0	25.9	25.9	41.9	O K
360 min Summer	29.711	0.161	0.0	24.2	24.2	27.6	O K
480 min Summer	29.649	0.099	0.0	24.1	24.1	16.9	O K
600 min Summer	29.620	0.070	0.0	21.6	21.6	12.0	O K
720 min Summer	29.600	0.050	0.0	19.2	19.2	8.6	O K
960 min Summer	29.575	0.025	0.0	15.8	15.8	4.2	O K
1440 min Summer	29.550	0.000	0.0	11.8	11.8	0.0	O K
2160 min Summer	29.550	0.000	0.0	8.2	8.2	0.0	O K
2880 min Summer	29.550	0.000	0.0	6.4	6.4	0.0	O K
4320 min Summer	29.550	0.000	0.0	4.6	4.6	0.0	O K
5760 min Summer	29.550	0.000	0.0	3.6	3.6	0.0	O K
7200 min Summer	29.550	0.000	0.0	3.1	3.1	0.0	O K
8640 min Summer	29.550	0.000	0.0	2.7	2.7	0.0	O K
10080 min Summer	29.550	0.000	0.0	2.4	2.4	0.0	O K
15 min Winter	29.886	0.336	0.0	28.7	28.7	57.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	89.463	0.0	78.9	16
30 min Summer	58.008	0.0	101.9	25
60 min Summer	35.848	0.0	127.0	42
120 min Summer	22.646	0.0	159.8	76
180 min Summer	16.982	0.0	179.1	110
240 min Summer	13.713	0.0	193.1	142
360 min Summer	9.995	0.0	211.2	202
480 min Summer	7.903	0.0	222.7	256
600 min Summer	6.557	0.0	231.0	314
720 min Summer	5.616	0.0	237.4	376
960 min Summer	4.381	0.0	247.0	492
1440 min Summer	3.067	0.0	259.4	0
2160 min Summer	2.146	0.0	272.3	0
2880 min Summer	1.673	0.0	283.0	0
4320 min Summer	1.192	0.0	302.4	0
5760 min Summer	0.947	0.0	320.3	0
7200 min Summer	0.800	0.0	338.2	0
8640 min Summer	0.701	0.0	355.9	0
10080 min Summer	0.631	0.0	373.3	0
15 min Winter	89.463	0.0	78.9	16

Summary of Results for 30 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	29.920	0.370	0.0	29.7	29.7	63.3	O K
60 min Winter	29.899	0.349	0.0	29.1	29.1	59.7	O K
120 min Winter	29.844	0.294	0.0	27.5	27.5	50.3	O K
180 min Winter	29.778	0.228	0.0	25.3	25.3	39.1	O K
240 min Winter	29.712	0.162	0.0	24.2	24.2	27.7	O K
360 min Winter	29.628	0.078	0.0	22.5	22.5	13.3	O K
480 min Winter	29.595	0.045	0.0	18.5	18.5	7.6	O K
600 min Winter	29.574	0.024	0.0	15.7	15.7	4.2	O K
720 min Winter	29.560	0.010	0.0	13.6	13.6	1.8	O K
960 min Winter	29.550	0.000	0.0	10.8	10.8	0.0	O K
1440 min Winter	29.550	0.000	0.0	7.6	7.6	0.0	O K
2160 min Winter	29.550	0.000	0.0	5.3	5.3	0.0	O K
2880 min Winter	29.550	0.000	0.0	4.1	4.1	0.0	O K
4320 min Winter	29.550	0.000	0.0	3.0	3.0	0.0	O K
5760 min Winter	29.550	0.000	0.0	2.3	2.3	0.0	O K
7200 min Winter	29.550	0.000	0.0	2.0	2.0	0.0	O K
8640 min Winter	29.550	0.000	0.0	1.7	1.7	0.0	O K
10080 min Winter	29.550	0.000	0.0	1.6	1.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	58.008	0.0	101.9	26
60 min Winter	35.848	0.0	125.6	44
120 min Winter	22.646	0.0	160.2	82
180 min Winter	16.982	0.0	179.1	116
240 min Winter	13.713	0.0	193.4	148
360 min Winter	9.995	0.0	211.0	200
480 min Winter	7.903	0.0	222.7	258
600 min Winter	6.557	0.0	231.2	318
720 min Winter	5.616	0.0	237.4	376
960 min Winter	4.381	0.0	247.0	0
1440 min Winter	3.067	0.0	259.4	0
2160 min Winter	2.146	0.0	272.3	0
2880 min Winter	1.673	0.0	283.0	0
4320 min Winter	1.192	0.0	302.4	0
5760 min Winter	0.947	0.0	320.3	0
7200 min Winter	0.800	0.0	338.2	0
8640 min Winter	0.701	0.0	355.9	0
10080 min Winter	0.631	0.0	373.3	0

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.371

Time (mins) From:	To:	Area (ha)
0	4	0.371

Model Details

Storage is Online Cover Level (m) 31.020

Cellular Storage Structure

Invert Level (m) 29.550 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	180.0	180.0	0.801	0.0	226.4
0.800	180.0	226.4			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0205-4000-0930-4000
Design Head (m)	0.930
Design Flow (l/s)	40.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	205
Invert Level (m)	29.420
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.930	40.0
Flush-Flo™	0.240	24.2
Kick-Flo®	0.306	23.5
Mean Flow over Head Range	-	26.5

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	7.7	1.200	45.2	3.000	70.5	7.000	106.5
0.200	21.6	1.400	48.7	3.500	75.9	7.500	110.1
0.300	23.6	1.600	52.0	4.000	81.0	8.000	113.7
0.400	26.7	1.800	55.0	4.500	85.8	8.500	117.1
0.500	29.7	2.000	57.9	5.000	90.3	9.000	120.4
0.600	32.4	2.200	60.6	5.500	94.6	9.500	123.0
0.800	37.2	2.400	63.2	6.000	98.7		
1.000	41.4	2.600	65.7	6.500	102.7		

Summary of Results for 100 year Return Period

Half Drain Time : 31 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ Outflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	30.010	0.460	0.0	32.2	32.2	78.7	O K
30 min Summer	30.074	0.524	0.0	33.8	33.8	89.6	O K
60 min Summer	30.079	0.529	0.0	33.9	33.9	90.5	O K
120 min Summer	30.051	0.501	0.0	33.2	33.2	85.7	O K
180 min Summer	30.002	0.452	0.0	32.0	32.0	77.4	O K
240 min Summer	29.951	0.401	0.0	30.6	30.6	68.6	O K
360 min Summer	29.855	0.305	0.0	27.8	27.8	52.2	O K
480 min Summer	29.776	0.226	0.0	25.3	25.3	38.6	O K
600 min Summer	29.704	0.154	0.0	24.2	24.2	26.4	O K
720 min Summer	29.652	0.102	0.0	24.2	24.2	17.4	O K
960 min Summer	29.609	0.059	0.0	20.3	20.3	10.2	O K
1440 min Summer	29.569	0.019	0.0	14.9	14.9	3.3	O K
2160 min Summer	29.550	0.000	0.0	10.7	10.7	0.0	O K
2880 min Summer	29.550	0.000	0.0	8.2	8.2	0.0	O K
4320 min Summer	29.550	0.000	0.0	5.7	5.7	0.0	O K
5760 min Summer	29.550	0.000	0.0	4.4	4.4	0.0	O K
7200 min Summer	29.550	0.000	0.0	3.7	3.7	0.0	O K
8640 min Summer	29.550	0.000	0.0	3.2	3.2	0.0	O K
10080 min Summer	29.550	0.000	0.0	2.8	2.8	0.0	O K
15 min Winter	30.012	0.462	0.0	32.2	32.2	79.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	116.573	0.0	102.9	16
30 min Summer	76.373	0.0	134.6	26
60 min Summer	47.487	0.0	167.3	44
120 min Summer	29.731	0.0	209.9	78
180 min Summer	22.306	0.0	235.8	112
240 min Summer	18.050	0.0	254.3	144
360 min Summer	13.214	0.0	279.5	208
480 min Summer	10.482	0.0	295.7	270
600 min Summer	8.705	0.0	306.9	328
720 min Summer	7.451	0.0	315.0	378
960 min Summer	5.789	0.0	326.4	494
1440 min Summer	4.024	0.0	340.3	736
2160 min Summer	2.780	0.0	352.7	0
2880 min Summer	2.139	0.0	361.9	0
4320 min Summer	1.486	0.0	377.0	0
5760 min Summer	1.155	0.0	390.7	0
7200 min Summer	0.960	0.0	406.0	0
8640 min Summer	0.831	0.0	421.7	0
10080 min Summer	0.739	0.0	437.8	0
15 min Winter	116.573	0.0	102.9	16

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	30.076	0.526	0.0	33.8	33.8	89.9	O K
60 min Winter	30.071	0.521	0.0	33.7	33.7	89.2	O K
120 min Winter	30.012	0.462	0.0	32.2	32.2	79.0	O K
180 min Winter	29.938	0.388	0.0	30.2	30.2	66.3	O K
240 min Winter	29.867	0.317	0.0	28.2	28.2	54.2	O K
360 min Winter	29.744	0.194	0.0	24.2	24.2	33.2	O K
480 min Winter	29.644	0.094	0.0	24.1	24.1	16.0	O K
600 min Winter	29.611	0.061	0.0	20.6	20.6	10.5	O K
720 min Winter	29.590	0.040	0.0	17.9	17.9	6.8	O K
960 min Winter	29.564	0.014	0.0	14.1	14.1	2.3	O K
1440 min Winter	29.550	0.000	0.0	10.0	10.0	0.0	O K
2160 min Winter	29.550	0.000	0.0	6.9	6.9	0.0	O K
2880 min Winter	29.550	0.000	0.0	5.3	5.3	0.0	O K
4320 min Winter	29.550	0.000	0.0	3.7	3.7	0.0	O K
5760 min Winter	29.550	0.000	0.0	2.9	2.9	0.0	O K
7200 min Winter	29.550	0.000	0.0	2.4	2.4	0.0	O K
8640 min Winter	29.550	0.000	0.0	2.1	2.1	0.0	O K
10080 min Winter	29.550	0.000	0.0	1.8	1.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	76.373	0.0	134.6	28
60 min Winter	47.487	0.0	167.5	46
120 min Winter	29.731	0.0	208.8	84
180 min Winter	22.306	0.0	236.3	118
240 min Winter	18.050	0.0	254.7	152
360 min Winter	13.214	0.0	279.6	216
480 min Winter	10.482	0.0	295.4	262
600 min Winter	8.705	0.0	306.9	320
720 min Winter	7.451	0.0	315.1	378
960 min Winter	5.789	0.0	326.4	500
1440 min Winter	4.024	0.0	340.4	0
2160 min Winter	2.780	0.0	352.7	0
2880 min Winter	2.139	0.0	361.9	0
4320 min Winter	1.486	0.0	377.0	0
5760 min Winter	1.155	0.0	390.7	0
7200 min Winter	0.960	0.0	406.0	0
8640 min Winter	0.831	0.0	421.7	0
10080 min Winter	0.739	0.0	437.8	0

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.371

Time (mins) From:	To:	Area (ha)
0	4	0.371

Model Details

Storage is Online Cover Level (m) 31.020

Cellular Storage Structure

Invert Level (m) 29.550 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	180.0	180.0	0.801	0.0	226.4
0.800	180.0	226.4			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0205-4000-0930-4000
Design Head (m)	0.930
Design Flow (l/s)	40.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	205
Invert Level (m)	29.420
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.930	40.0
Flush-Flo™	0.240	24.2
Kick-Flo®	0.306	23.5
Mean Flow over Head Range	-	26.5

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	7.7	1.200	45.2	3.000	70.5	7.000	106.5
0.200	21.6	1.400	48.7	3.500	75.9	7.500	110.1
0.300	23.6	1.600	52.0	4.000	81.0	8.000	113.7
0.400	26.7	1.800	55.0	4.500	85.8	8.500	117.1
0.500	29.7	2.000	57.9	5.000	90.3	9.000	120.4
0.600	32.4	2.200	60.6	5.500	94.6	9.500	123.0
0.800	37.2	2.400	63.2	6.000	98.7		
1.000	41.4	2.600	65.7	6.500	102.7		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 33 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	30.228	0.678	0.0	37.4	37.4	115.9	O K
30 min Summer	30.339	0.789	0.0	39.8	39.8	135.0	O K
60 min Summer	31.020	1.470	0.0	52.0	52.0	138.0	FLOOD
120 min Summer	30.487	0.937	0.0	42.7	42.7	137.0	O K
180 min Summer	30.298	0.748	0.0	38.9	38.9	127.8	O K
240 min Summer	30.234	0.684	0.0	37.5	37.5	117.0	O K
360 min Summer	30.111	0.561	0.0	34.7	34.7	95.8	O K
480 min Summer	30.002	0.452	0.0	32.0	32.0	77.3	O K
600 min Summer	29.912	0.362	0.0	29.5	29.5	61.9	O K
720 min Summer	29.837	0.287	0.0	27.2	27.2	49.1	O K
960 min Summer	29.714	0.164	0.0	24.2	24.2	28.0	O K
1440 min Summer	29.612	0.062	0.0	20.6	20.6	10.5	O K
2160 min Summer	29.568	0.018	0.0	14.7	14.7	3.0	O K
2880 min Summer	29.550	0.000	0.0	11.5	11.5	0.0	O K
4320 min Summer	29.550	0.000	0.0	8.0	8.0	0.0	O K
5760 min Summer	29.550	0.000	0.0	6.2	6.2	0.0	O K
7200 min Summer	29.550	0.000	0.0	5.2	5.2	0.0	O K
8640 min Summer	29.550	0.000	0.0	4.5	4.5	0.0	O K
10080 min Summer	29.550	0.000	0.0	4.0	4.0	0.0	O K
15 min Winter	30.230	0.680	0.0	37.4	37.4	116.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	163.202	0.0	143.9	16
30 min Summer	106.922	0.0	188.3	29
60 min Summer	66.481	1.1	233.9	42
120 min Summer	41.623	0.0	293.7	80
180 min Summer	31.228	0.0	330.8	114
240 min Summer	25.270	0.0	356.4	148
360 min Summer	18.499	0.0	390.8	212
480 min Summer	14.675	0.0	413.6	274
600 min Summer	12.187	0.0	429.3	336
720 min Summer	10.432	0.0	441.3	398
960 min Summer	8.105	0.0	457.1	518
1440 min Summer	5.633	0.0	476.4	736
2160 min Summer	3.892	0.0	493.9	1100
2880 min Summer	2.995	0.0	506.7	0
4320 min Summer	2.080	0.0	527.8	0
5760 min Summer	1.616	0.0	546.9	0
7200 min Summer	1.344	0.0	568.4	0
8640 min Summer	1.163	0.0	590.4	0
10080 min Summer	1.035	0.0	613.0	0
15 min Winter	163.202	0.0	143.8	16

Summary of Results for 100 year Return Period (+40%)

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	30.346	0.796	0.0	39.9	39.9	136.0	O K
60 min Winter	31.020	1.470	0.0	52.0	52.0	137.7	FLOOD
120 min Winter	30.316	0.766	0.0	39.3	39.3	131.0	O K
180 min Winter	30.227	0.677	0.0	37.4	37.4	115.8	O K
240 min Winter	30.138	0.588	0.0	35.3	35.3	100.5	O K
360 min Winter	29.979	0.429	0.0	31.3	31.3	73.4	O K
480 min Winter	29.853	0.303	0.0	27.7	27.7	51.9	O K
600 min Winter	29.751	0.201	0.0	24.4	24.4	34.3	O K
720 min Winter	29.653	0.103	0.0	24.2	24.2	17.6	O K
960 min Winter	29.604	0.054	0.0	19.7	19.7	9.2	O K
1440 min Winter	29.562	0.012	0.0	13.8	13.8	2.0	O K
2160 min Winter	29.550	0.000	0.0	9.6	9.6	0.0	O K
2880 min Winter	29.550	0.000	0.0	7.4	7.4	0.0	O K
4320 min Winter	29.550	0.000	0.0	5.2	5.2	0.0	O K
5760 min Winter	29.550	0.000	0.0	4.0	4.0	0.0	O K
7200 min Winter	29.550	0.000	0.0	3.3	3.3	0.0	O K
8640 min Winter	29.550	0.000	0.0	2.9	2.9	0.0	O K
10080 min Winter	29.550	0.000	0.0	2.6	2.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	106.922	0.0	188.2	29
60 min Winter	66.481	0.9	233.5	46
120 min Winter	41.623	0.0	293.8	86
180 min Winter	31.228	0.0	329.8	122
240 min Winter	25.270	0.0	356.9	156
360 min Winter	18.499	0.0	390.9	222
480 min Winter	14.675	0.0	413.9	286
600 min Winter	12.187	0.0	429.5	348
720 min Winter	10.432	0.0	441.2	390
960 min Winter	8.105	0.0	457.0	500
1440 min Winter	5.633	0.0	476.5	738
2160 min Winter	3.892	0.0	493.8	0
2880 min Winter	2.995	0.0	506.7	0
4320 min Winter	2.080	0.0	527.8	0
5760 min Winter	1.616	0.0	546.9	0
7200 min Winter	1.344	0.0	568.4	0
8640 min Winter	1.163	0.0	590.4	0
10080 min Winter	1.035	0.0	613.0	0

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.371

Time (mins) From:	To:	Area (ha)
0	4	0.371

Model Details

Storage is Online Cover Level (m) 31.020

Cellular Storage Structure

Invert Level (m) 29.550 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	180.0	180.0	0.801	0.0	226.4
0.800	180.0	226.4			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0205-4000-0930-4000
Design Head (m)	0.930
Design Flow (l/s)	40.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	205
Invert Level (m)	29.420
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.930	40.0
Flush-Flo™	0.240	24.2
Kick-Flo®	0.306	23.5
Mean Flow over Head Range	-	26.5

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	7.7	1.200	45.2	3.000	70.5	7.000	106.5
0.200	21.6	1.400	48.7	3.500	75.9	7.500	110.1
0.300	23.6	1.600	52.0	4.000	81.0	8.000	113.7
0.400	26.7	1.800	55.0	4.500	85.8	8.500	117.1
0.500	29.7	2.000	57.9	5.000	90.3	9.000	120.4
0.600	32.4	2.200	60.6	5.500	94.6	9.500	123.0
0.800	37.2	2.400	63.2	6.000	98.7		
1.000	41.4	2.600	65.7	6.500	102.7		

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APPENDIX J
PROPOSED ATTENUATION MICRODRAINAGE RESULTS

Summary of Results for 2 year Return Period

Half Drain Time : 7 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	29.643	0.093	0.0	24.0	24.0	16.5	O K
30 min Summer	29.642	0.092	0.0	23.9	23.9	16.3	O K
60 min Summer	29.628	0.078	0.0	22.5	22.5	13.9	O K
120 min Summer	29.623	0.073	0.0	21.9	21.9	13.0	O K
180 min Summer	29.609	0.059	0.0	20.3	20.3	10.4	O K
240 min Summer	29.595	0.045	0.0	18.6	18.6	8.1	O K
360 min Summer	29.575	0.025	0.0	15.8	15.8	4.4	O K
480 min Summer	29.561	0.011	0.0	13.7	13.7	1.9	O K
600 min Summer	29.552	0.002	0.0	12.4	12.4	0.4	O K
720 min Summer	29.550	0.000	0.0	11.1	11.1	0.0	O K
960 min Summer	29.550	0.000	0.0	8.8	8.8	0.0	O K
1440 min Summer	29.550	0.000	0.0	6.3	6.3	0.0	O K
2160 min Summer	29.550	0.000	0.0	4.5	4.5	0.0	O K
2880 min Summer	29.550	0.000	0.0	3.6	3.6	0.0	O K
4320 min Summer	29.550	0.000	0.0	2.7	2.7	0.0	O K
5760 min Summer	29.550	0.000	0.0	2.2	2.2	0.0	O K
7200 min Summer	29.550	0.000	0.0	1.9	1.9	0.0	O K
8640 min Summer	29.550	0.000	0.0	1.7	1.7	0.0	O K
10080 min Summer	29.550	0.000	0.0	1.5	1.5	0.0	O K
15 min Winter	29.642	0.092	0.0	23.9	23.9	16.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	35.969	0.0	31.5	13
30 min Summer	22.980	0.0	40.2	22
60 min Summer	14.223	0.0	48.9	38
120 min Summer	10.186	0.0	71.0	70
180 min Summer	8.031	0.0	84.0	102
240 min Summer	6.670	0.0	92.7	132
360 min Summer	5.014	0.0	104.5	192
480 min Summer	4.032	0.0	112.0	250
600 min Summer	3.386	0.0	117.8	308
720 min Summer	2.928	0.0	122.2	0
960 min Summer	2.319	0.0	129.0	0
1440 min Summer	1.662	0.0	138.7	0
2160 min Summer	1.196	0.0	149.8	0
2880 min Summer	0.954	0.0	159.2	0
4320 min Summer	0.705	0.0	176.4	0
5760 min Summer	0.576	0.0	192.3	0
7200 min Summer	0.498	0.0	207.7	0
8640 min Summer	0.445	0.0	222.7	0
10080 min Summer	0.407	0.0	237.6	0
15 min Winter	35.969	0.0	31.5	14

Summary of Results for 2 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	29.636	0.086	0.0	23.3	23.3	15.4	O K
60 min Winter	29.615	0.065	0.0	21.0	21.0	11.5	O K
120 min Winter	29.599	0.049	0.0	19.1	19.1	8.8	O K
180 min Winter	29.582	0.032	0.0	16.8	16.8	5.7	O K
240 min Winter	29.568	0.018	0.0	14.8	14.8	3.2	O K
360 min Winter	29.550	0.000	0.0	12.1	12.1	0.1	O K
480 min Winter	29.550	0.000	0.0	9.8	9.8	0.0	O K
600 min Winter	29.550	0.000	0.0	8.3	8.3	0.0	O K
720 min Winter	29.550	0.000	0.0	7.2	7.2	0.0	O K
960 min Winter	29.550	0.000	0.0	5.7	5.7	0.0	O K
1440 min Winter	29.550	0.000	0.0	4.1	4.1	0.0	O K
2160 min Winter	29.550	0.000	0.0	2.9	2.9	0.0	O K
2880 min Winter	29.550	0.000	0.0	2.3	2.3	0.0	O K
4320 min Winter	29.550	0.000	0.0	1.7	1.7	0.0	O K
5760 min Winter	29.550	0.000	0.0	1.4	1.4	0.0	O K
7200 min Winter	29.550	0.000	0.0	1.2	1.2	0.0	O K
8640 min Winter	29.550	0.000	0.0	1.1	1.1	0.0	O K
10080 min Winter	29.550	0.000	0.0	1.0	1.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	22.980	0.0	39.5	23
60 min Winter	14.223	0.0	48.8	40
120 min Winter	10.186	0.0	70.7	72
180 min Winter	8.031	0.0	83.5	104
240 min Winter	6.670	0.0	92.8	134
360 min Winter	5.014	0.0	104.6	186
480 min Winter	4.032	0.0	112.2	0
600 min Winter	3.386	0.0	117.7	0
720 min Winter	2.928	0.0	122.2	0
960 min Winter	2.319	0.0	129.0	0
1440 min Winter	1.662	0.0	138.7	0
2160 min Winter	1.196	0.0	149.8	0
2880 min Winter	0.954	0.0	159.2	0
4320 min Winter	0.705	0.0	176.4	0
5760 min Winter	0.576	0.0	192.3	0
7200 min Winter	0.498	0.0	207.7	0
8640 min Winter	0.445	0.0	222.7	0
10080 min Winter	0.407	0.0	237.6	0

Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.366

Time (mins) From:	To:	Area (ha)
0	4	0.366

Model Details

Storage is Online Cover Level (m) 31.020

Cellular Storage Structure

Invert Level (m) 29.550 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	187.5	187.5	0.801	0.0	231.5
0.800	187.5	231.5			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0205-4000-0930-4000
Design Head (m)	0.930
Design Flow (l/s)	40.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	205
Invert Level (m)	29.420
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.930	40.0
Flush-Flo™	0.240	24.2
Kick-Flo®	0.306	23.5
Mean Flow over Head Range	-	26.5

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	7.7	1.200	45.2	3.000	70.5	7.000	106.5
0.200	21.6	1.400	48.7	3.500	75.9	7.500	110.1
0.300	23.6	1.600	52.0	4.000	81.0	8.000	113.7
0.400	26.7	1.800	55.0	4.500	85.8	8.500	117.1
0.500	29.7	2.000	57.9	5.000	90.3	9.000	120.4
0.600	32.4	2.200	60.6	5.500	94.6	9.500	123.0
0.800	37.2	2.400	63.2	6.000	98.7		
1.000	41.4	2.600	65.7	6.500	102.7		

Summary of Results for 30 year Return Period

Half Drain Time : 23 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	29.867	0.317	0.0	28.2	28.2	56.5	O K
30 min Summer	29.901	0.351	0.0	29.2	29.2	62.5	O K
60 min Summer	29.892	0.342	0.0	28.9	28.9	60.9	O K
120 min Summer	29.866	0.316	0.0	28.1	28.1	56.3	O K
180 min Summer	29.824	0.274	0.0	26.8	26.8	48.9	O K
240 min Summer	29.782	0.232	0.0	25.5	25.5	41.3	O K
360 min Summer	29.700	0.150	0.0	24.2	24.2	26.7	O K
480 min Summer	29.644	0.094	0.0	24.1	24.1	16.7	O K
600 min Summer	29.617	0.067	0.0	21.2	21.2	11.9	O K
720 min Summer	29.598	0.048	0.0	18.9	18.9	8.5	O K
960 min Summer	29.573	0.023	0.0	15.4	15.4	4.1	O K
1440 min Summer	29.550	0.000	0.0	11.6	11.6	0.0	O K
2160 min Summer	29.550	0.000	0.0	8.1	8.1	0.0	O K
2880 min Summer	29.550	0.000	0.0	6.3	6.3	0.0	O K
4320 min Summer	29.550	0.000	0.0	4.5	4.5	0.0	O K
5760 min Summer	29.550	0.000	0.0	3.6	3.6	0.0	O K
7200 min Summer	29.550	0.000	0.0	3.0	3.0	0.0	O K
8640 min Summer	29.550	0.000	0.0	2.7	2.7	0.0	O K
10080 min Summer	29.550	0.000	0.0	2.4	2.4	0.0	O K
15 min Winter	29.868	0.318	0.0	28.2	28.2	56.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	89.463	0.0	77.9	16
30 min Summer	58.008	0.0	100.5	25
60 min Summer	35.848	0.0	123.8	42
120 min Summer	22.646	0.0	157.7	76
180 min Summer	16.982	0.0	176.8	110
240 min Summer	13.713	0.0	190.6	142
360 min Summer	9.995	0.0	208.7	202
480 min Summer	7.903	0.0	219.7	256
600 min Summer	6.557	0.0	227.9	316
720 min Summer	5.616	0.0	234.3	376
960 min Summer	4.381	0.0	243.6	492
1440 min Summer	3.067	0.0	255.9	0
2160 min Summer	2.146	0.0	268.7	0
2880 min Summer	1.673	0.0	279.2	0
4320 min Summer	1.192	0.0	298.3	0
5760 min Summer	0.947	0.0	316.0	0
7200 min Summer	0.800	0.0	333.7	0
8640 min Summer	0.701	0.0	351.1	0
10080 min Summer	0.631	0.0	368.3	0
15 min Winter	89.463	0.0	77.9	16

Summary of Results for 30 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	29.900	0.350	0.0	29.1	29.1	62.4	O K
60 min Winter	29.880	0.330	0.0	28.6	28.6	58.8	O K
120 min Winter	29.828	0.278	0.0	27.0	27.0	49.6	O K
180 min Winter	29.765	0.215	0.0	24.9	24.9	38.4	O K
240 min Winter	29.700	0.150	0.0	24.2	24.2	26.7	O K
360 min Winter	29.625	0.075	0.0	22.1	22.1	13.3	O K
480 min Winter	29.592	0.042	0.0	18.2	18.2	7.6	O K
600 min Winter	29.573	0.023	0.0	15.4	15.4	4.1	O K
720 min Winter	29.559	0.009	0.0	13.4	13.4	1.6	O K
960 min Winter	29.550	0.000	0.0	10.7	10.7	0.0	O K
1440 min Winter	29.550	0.000	0.0	7.5	7.5	0.0	O K
2160 min Winter	29.550	0.000	0.0	5.2	5.2	0.0	O K
2880 min Winter	29.550	0.000	0.0	4.1	4.1	0.0	O K
4320 min Winter	29.550	0.000	0.0	2.9	2.9	0.0	O K
5760 min Winter	29.550	0.000	0.0	2.3	2.3	0.0	O K
7200 min Winter	29.550	0.000	0.0	2.0	2.0	0.0	O K
8640 min Winter	29.550	0.000	0.0	1.7	1.7	0.0	O K
10080 min Winter	29.550	0.000	0.0	1.5	1.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	58.008	0.0	100.6	26
60 min Winter	35.848	0.0	123.9	44
120 min Winter	22.646	0.0	156.8	82
180 min Winter	16.982	0.0	176.8	116
240 min Winter	13.713	0.0	190.5	146
360 min Winter	9.995	0.0	208.2	200
480 min Winter	7.903	0.0	219.8	258
600 min Winter	6.557	0.0	227.9	318
720 min Winter	5.616	0.0	234.3	376
960 min Winter	4.381	0.0	243.7	0
1440 min Winter	3.067	0.0	255.9	0
2160 min Winter	2.146	0.0	268.7	0
2880 min Winter	1.673	0.0	279.2	0
4320 min Winter	1.192	0.0	298.3	0
5760 min Winter	0.947	0.0	316.0	0
7200 min Winter	0.800	0.0	333.7	0
8640 min Winter	0.701	0.0	351.1	0
10080 min Winter	0.631	0.0	368.3	0

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.366

Time (mins) From:	To:	Area (ha)
0	4	0.366

Model Details

Storage is Online Cover Level (m) 31.020

Cellular Storage Structure

Invert Level (m) 29.550 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	187.5	187.5	0.801	0.0	231.5
0.800	187.5	231.5			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0205-4000-0930-4000
Design Head (m)	0.930
Design Flow (l/s)	40.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	205
Invert Level (m)	29.420
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.930	40.0
Flush-Flo™	0.240	24.2
Kick-Flo®	0.306	23.5
Mean Flow over Head Range	-	26.5

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	7.7	1.200	45.2	3.000	70.5	7.000	106.5
0.200	21.6	1.400	48.7	3.500	75.9	7.500	110.1
0.300	23.6	1.600	52.0	4.000	81.0	8.000	113.7
0.400	26.7	1.800	55.0	4.500	85.8	8.500	117.1
0.500	29.7	2.000	57.9	5.000	90.3	9.000	120.4
0.600	32.4	2.200	60.6	5.500	94.6	9.500	123.0
0.800	37.2	2.400	63.2	6.000	98.7		
1.000	41.4	2.600	65.7	6.500	102.7		

Summary of Results for 100 year Return Period

Half Drain Time : 31 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	29.986	0.436	0.0	31.5	31.5	77.7	O K
30 min Summer	30.046	0.496	0.0	33.1	33.1	88.4	O K
60 min Summer	30.052	0.502	0.0	33.2	33.2	89.4	O K
120 min Summer	30.025	0.475	0.0	32.6	32.6	84.7	O K
180 min Summer	29.979	0.429	0.0	31.3	31.3	76.4	O K
240 min Summer	29.930	0.380	0.0	30.0	30.0	67.7	O K
360 min Summer	29.839	0.289	0.0	27.3	27.3	51.5	O K
480 min Summer	29.763	0.213	0.0	24.8	24.8	37.9	O K
600 min Summer	29.693	0.143	0.0	24.2	24.2	25.5	O K
720 min Summer	29.646	0.096	0.0	24.1	24.1	17.2	O K
960 min Summer	29.607	0.057	0.0	20.0	20.0	10.1	O K
1440 min Summer	29.568	0.018	0.0	14.7	14.7	3.2	O K
2160 min Summer	29.550	0.000	0.0	10.5	10.5	0.0	O K
2880 min Summer	29.550	0.000	0.0	8.1	8.1	0.0	O K
4320 min Summer	29.550	0.000	0.0	5.6	5.6	0.0	O K
5760 min Summer	29.550	0.000	0.0	4.4	4.4	0.0	O K
7200 min Summer	29.550	0.000	0.0	3.6	3.6	0.0	O K
8640 min Summer	29.550	0.000	0.0	3.1	3.1	0.0	O K
10080 min Summer	29.550	0.000	0.0	2.8	2.8	0.0	O K
15 min Winter	29.988	0.438	0.0	31.6	31.6	78.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	116.573	0.0	101.5	16
30 min Summer	76.373	0.0	132.8	26
60 min Summer	47.487	0.0	165.0	44
120 min Summer	29.731	0.0	207.0	78
180 min Summer	22.306	0.0	232.6	112
240 min Summer	18.050	0.0	251.0	144
360 min Summer	13.214	0.0	275.8	208
480 min Summer	10.482	0.0	291.2	270
600 min Summer	8.705	0.0	302.5	326
720 min Summer	7.451	0.0	310.7	378
960 min Summer	5.789	0.0	322.1	494
1440 min Summer	4.024	0.0	335.7	736
2160 min Summer	2.780	0.0	347.9	0
2880 min Summer	2.139	0.0	357.0	0
4320 min Summer	1.486	0.0	371.9	0
5760 min Summer	1.155	0.0	385.4	0
7200 min Summer	0.960	0.0	400.5	0
8640 min Summer	0.831	0.0	416.0	0
10080 min Summer	0.739	0.0	431.9	0
15 min Winter	116.573	0.0	101.5	16

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	30.049	0.499	0.0	33.1	33.1	88.8	O K
60 min Winter	30.044	0.494	0.0	33.0	33.0	88.1	O K
120 min Winter	29.988	0.438	0.0	31.6	31.6	78.0	O K
180 min Winter	29.917	0.367	0.0	29.6	29.6	65.4	O K
240 min Winter	29.850	0.300	0.0	27.6	27.6	53.4	O K
360 min Winter	29.731	0.181	0.0	24.2	24.2	32.2	O K
480 min Winter	29.640	0.090	0.0	23.7	23.7	16.0	O K
600 min Winter	29.609	0.059	0.0	20.3	20.3	10.5	O K
720 min Winter	29.588	0.038	0.0	17.7	17.7	6.8	O K
960 min Winter	29.562	0.012	0.0	13.9	13.9	2.2	O K
1440 min Winter	29.550	0.000	0.0	9.8	9.8	0.0	O K
2160 min Winter	29.550	0.000	0.0	6.8	6.8	0.0	O K
2880 min Winter	29.550	0.000	0.0	5.2	5.2	0.0	O K
4320 min Winter	29.550	0.000	0.0	3.6	3.6	0.0	O K
5760 min Winter	29.550	0.000	0.0	2.8	2.8	0.0	O K
7200 min Winter	29.550	0.000	0.0	2.3	2.3	0.0	O K
8640 min Winter	29.550	0.000	0.0	2.0	2.0	0.0	O K
10080 min Winter	29.550	0.000	0.0	1.8	1.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	76.373	0.0	132.7	28
60 min Winter	47.487	0.0	165.2	46
120 min Winter	29.731	0.0	207.3	84
180 min Winter	22.306	0.0	233.1	118
240 min Winter	18.050	0.0	251.3	152
360 min Winter	13.214	0.0	275.5	218
480 min Winter	10.482	0.0	291.5	262
600 min Winter	8.705	0.0	302.5	320
720 min Winter	7.451	0.0	310.7	378
960 min Winter	5.789	0.0	322.0	500
1440 min Winter	4.024	0.0	335.8	0
2160 min Winter	2.780	0.0	347.9	0
2880 min Winter	2.139	0.0	357.0	0
4320 min Winter	1.486	0.0	371.9	0
5760 min Winter	1.155	0.0	385.4	0
7200 min Winter	0.960	0.0	400.5	0
8640 min Winter	0.831	0.0	416.0	0
10080 min Winter	0.739	0.0	431.9	0

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.366

Time (mins) From:	To:	Area (ha)
0	4	0.366

Model Details

Storage is Online Cover Level (m) 31.020

Cellular Storage Structure

Invert Level (m) 29.550 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	187.5	187.5	0.801	0.0	231.5
0.800	187.5	231.5			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0205-4000-0930-4000
Design Head (m)	0.930
Design Flow (l/s)	40.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	205
Invert Level (m)	29.420
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.930	40.0
Flush-Flo™	0.240	24.2
Kick-Flo®	0.306	23.5
Mean Flow over Head Range	-	26.5

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	7.7	1.200	45.2	3.000	70.5	7.000	106.5
0.200	21.6	1.400	48.7	3.500	75.9	7.500	110.1
0.300	23.6	1.600	52.0	4.000	81.0	8.000	113.7
0.400	26.7	1.800	55.0	4.500	85.8	8.500	117.1
0.500	29.7	2.000	57.9	5.000	90.3	9.000	120.4
0.600	32.4	2.200	60.6	5.500	94.6	9.500	123.0
0.800	37.2	2.400	63.2	6.000	98.7		
1.000	41.4	2.600	65.7	6.500	102.7		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 40 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	30.192	0.642	0.0	36.6	36.6	114.4	O K
30 min Summer	30.299	0.749	0.0	38.9	38.9	133.4	O K
60 min Summer	30.325	0.775	0.0	39.5	39.5	138.1	O K
120 min Summer	30.312	0.762	0.0	39.2	39.2	135.7	O K
180 min Summer	30.260	0.710	0.0	38.1	38.1	126.4	O K
240 min Summer	30.200	0.650	0.0	36.8	36.8	115.8	O K
360 min Summer	30.082	0.532	0.0	34.0	34.0	94.8	O K
480 min Summer	29.979	0.429	0.0	31.3	31.3	76.5	O K
600 min Summer	29.893	0.343	0.0	28.9	28.9	61.1	O K
720 min Summer	29.821	0.271	0.0	26.8	26.8	48.3	O K
960 min Summer	29.701	0.151	0.0	24.2	24.2	26.8	O K
1440 min Summer	29.609	0.059	0.0	20.3	20.3	10.5	O K
2160 min Summer	29.566	0.016	0.0	14.5	14.5	2.9	O K
2880 min Summer	29.550	0.000	0.0	11.3	11.3	0.0	O K
4320 min Summer	29.550	0.000	0.0	7.9	7.9	0.0	O K
5760 min Summer	29.550	0.000	0.0	6.1	6.1	0.0	O K
7200 min Summer	29.550	0.000	0.0	5.1	5.1	0.0	O K
8640 min Summer	29.550	0.000	0.0	4.4	4.4	0.0	O K
10080 min Summer	29.550	0.000	0.0	3.9	3.9	0.0	O K
15 min Winter	30.195	0.645	0.0	36.6	36.6	114.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	163.202	0.0	141.8	16
30 min Summer	106.922	0.0	185.5	29
60 min Summer	66.481	0.0	231.1	46
120 min Summer	41.623	0.0	289.3	80
180 min Summer	31.228	0.0	326.1	114
240 min Summer	25.270	0.0	351.3	148
360 min Summer	18.499	0.0	386.1	212
480 min Summer	14.675	0.0	408.0	274
600 min Summer	12.187	0.0	423.5	336
720 min Summer	10.432	0.0	435.4	398
960 min Summer	8.105	0.0	450.8	512
1440 min Summer	5.633	0.0	470.1	736
2160 min Summer	3.892	0.0	487.2	1100
2880 min Summer	2.995	0.0	499.8	0
4320 min Summer	2.080	0.0	520.7	0
5760 min Summer	1.616	0.0	539.6	0
7200 min Summer	1.344	0.0	560.7	0
8640 min Summer	1.163	0.0	582.5	0
10080 min Summer	1.035	0.0	604.7	0
15 min Winter	163.202	0.0	141.8	16

Summary of Results for 100 year Return Period (+40%)

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	30.304	0.754	0.0	39.0	39.0	134.4	O K
60 min Winter	30.322	0.772	0.0	39.4	39.4	137.5	O K
120 min Winter	30.278	0.728	0.0	38.5	38.5	129.6	O K
180 min Winter	30.194	0.644	0.0	36.6	36.6	114.7	O K
240 min Winter	30.109	0.559	0.0	34.6	34.6	99.5	O K
360 min Winter	29.958	0.408	0.0	30.8	30.8	72.6	O K
480 min Winter	29.837	0.287	0.0	27.2	27.2	51.1	O K
600 min Winter	29.736	0.186	0.0	24.2	24.2	33.2	O K
720 min Winter	29.647	0.097	0.0	24.1	24.1	17.2	O K
960 min Winter	29.601	0.051	0.0	19.4	19.4	9.1	O K
1440 min Winter	29.561	0.011	0.0	13.7	13.7	1.9	O K
2160 min Winter	29.550	0.000	0.0	9.5	9.5	0.0	O K
2880 min Winter	29.550	0.000	0.0	7.3	7.3	0.0	O K
4320 min Winter	29.550	0.000	0.0	5.1	5.1	0.0	O K
5760 min Winter	29.550	0.000	0.0	3.9	3.9	0.0	O K
7200 min Winter	29.550	0.000	0.0	3.3	3.3	0.0	O K
8640 min Winter	29.550	0.000	0.0	2.8	2.8	0.0	O K
10080 min Winter	29.550	0.000	0.0	2.5	2.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	106.922	0.0	185.5	29
60 min Winter	66.481	0.0	230.9	48
120 min Winter	41.623	0.0	289.4	86
180 min Winter	31.228	0.0	325.0	122
240 min Winter	25.270	0.0	351.8	156
360 min Winter	18.499	0.0	385.6	222
480 min Winter	14.675	0.0	408.4	286
600 min Winter	12.187	0.0	423.5	350
720 min Winter	10.432	0.0	435.0	386
960 min Winter	8.105	0.0	450.8	500
1440 min Winter	5.633	0.0	470.0	736
2160 min Winter	3.892	0.0	487.1	0
2880 min Winter	2.995	0.0	499.8	0
4320 min Winter	2.080	0.0	520.7	0
5760 min Winter	1.616	0.0	539.6	0
7200 min Winter	1.344	0.0	560.7	0
8640 min Winter	1.163	0.0	582.5	0
10080 min Winter	1.035	0.0	604.7	0

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 504800 183685 TQ 04800 83685
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.366

Time (mins) From:	To:	Area (ha)
0	4	0.366

Model Details

Storage is Online Cover Level (m) 31.020

Cellular Storage Structure

Invert Level (m) 29.550 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	187.5	187.5	0.801	0.0	231.5
0.800	187.5	231.5			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0205-4000-0930-4000
Design Head (m)	0.930
Design Flow (l/s)	40.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	205
Invert Level (m)	29.420
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.930	40.0
Flush-Flo™	0.240	24.2
Kick-Flo®	0.306	23.5
Mean Flow over Head Range	-	26.5

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	7.7	1.200	45.2	3.000	70.5	7.000	106.5
0.200	21.6	1.400	48.7	3.500	75.9	7.500	110.1
0.300	23.6	1.600	52.0	4.000	81.0	8.000	113.7
0.400	26.7	1.800	55.0	4.500	85.8	8.500	117.1
0.500	29.7	2.000	57.9	5.000	90.3	9.000	120.4
0.600	32.4	2.200	60.6	5.500	94.6	9.500	123.0
0.800	37.2	2.400	63.2	6.000	98.7		
1.000	41.4	2.600	65.7	6.500	102.7		

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