BROOKBANKS

Land at North West Bicester

Technical Note: Response to LLFA Drainage Comments: 24th May 2022
Date: June 2022

1 Introduction

1.1 This technical note reviews the comments provided by Oxfordshire County Council dated 24th May 2022. The LLFA commentary is noted in *italics* with Brookbanks response noted in blue.

2 LLFA Drainage Comments

2.1 *Identify infiltration basins and attenuation basins clearly on the drainage drawing. Include arrows to indicate the outfall location to the watercourse with the discharge rate. For the infiltration basins provide the discharge rate used in m/s.*

2.2 The drainage plan has been updated to confirm whether each basin has been designed as attenuation or infiltration (this has been shown on the blue information boxes). For the attenuation basins, arrows have been provided to show which outfall the flow will be discharging to. Finally, the discharge rate for the infiltration basins have been altered from l/s to m/s. The updated plan is within **Appendix A**.

2.3 *Windes calculations and modelling of the proposed SuDS features to confirm capacity for the 1:100 year storm event plus 40% CC. Calculations only provided for catchments A to F. Provide calculations for all catchments.*

2.4 All basins have been designed to accommodate the 1 in 100 year plus 40% climate change storm event with all calculations provided within **Appendix B**.

2.5 *Provide ownership details of the watercourse and the permission to connect the surface water drainage at the proposed rates without increasing the risk of flooding. Confirm the capacity of the existing watercourse.*

2.6 The watercourse is located within the land ownership and therefore permission is not required to connect into it. The attenuation basins have been designed to discharged to QBAR, controlling the volume of surface water going into the watercourse. The infiltration basins are also removing surface water discharge directly into the watercourse. Ultimately, the reduced and controlled volume of storm water discharging into the watercourse will reduce the flood risk on site and downstream.

2.7 *The ground investigation report shows the majority of the site to be suitable for infiltration, however the use of infiltration basins is not maximised. There are some attenuation basins that could be infiltration basins according to the infiltration testing report provided.*

2.8 Infiltration basins have only been utilised in areas where testing confirmed that infiltration is viable by having an appropriate half drain down time. More localised infiltration features such as permeable paving and

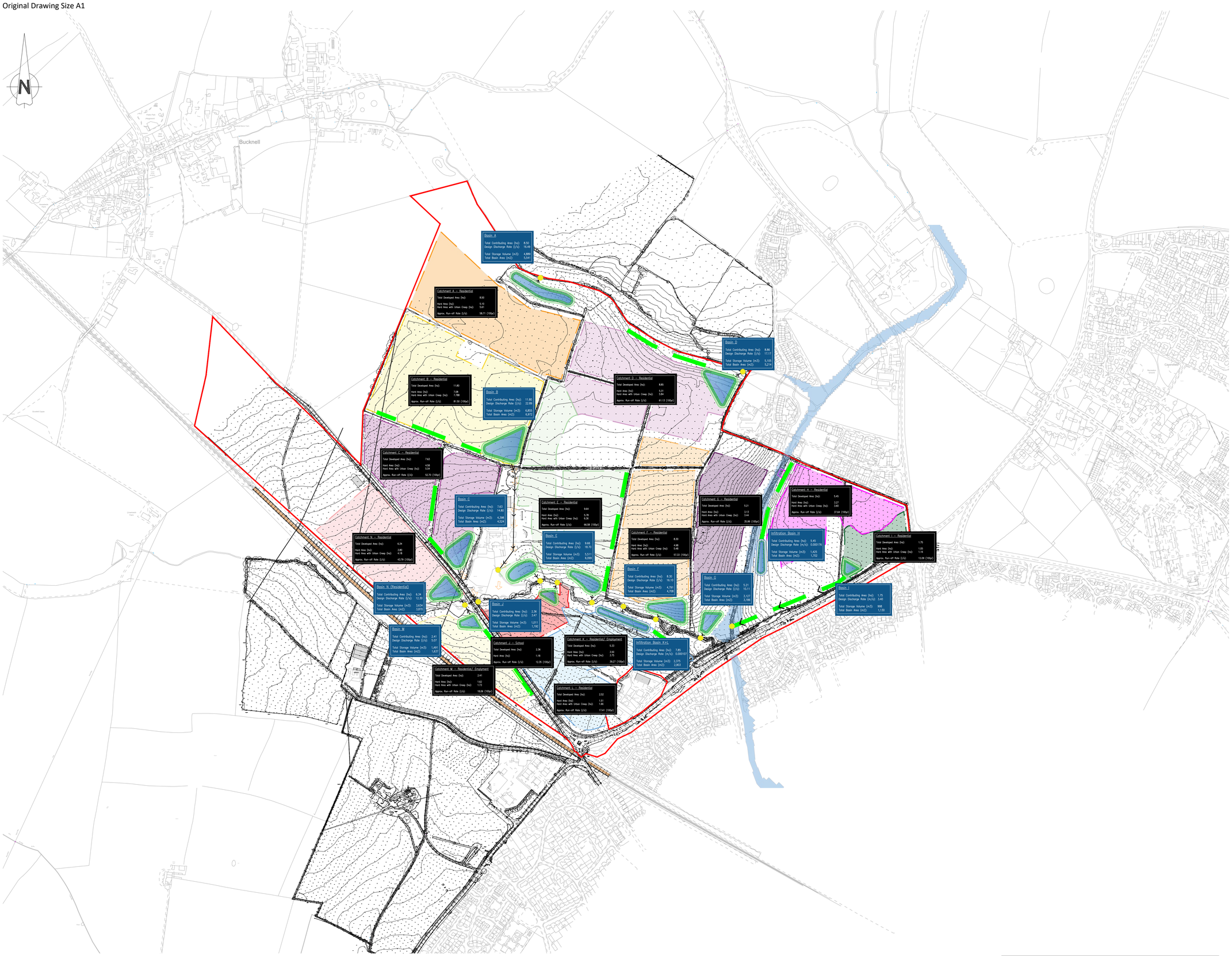
infiltration road side swales can be incorporated at the detailed design stage.

2.9 *Provide a phasing plan, demonstrating how the development will be split up in phases for detailed design. The phasing plan will need to adequately consider flood risk at all stages of flood risk.*

2.10 A phasing plan has yet to be completed. Any phasing of the site will ensure that the appropriate proposed drainage is constructed and operational before the development is occupied.

Appendix A – Drainage Strategy Plan (10663-DR-01 F)

Original Drawing Size A1



Construction Design and Management (CDM)
Key Residual Risks

Contractors entering the site should gain permission from the relevant land owners and/or principle contractor working on site at the time of entry. Contractors shall be responsible for carrying out their own risk assessments and for liaising with the relevant services companies and authorities. Listed below are Site Specific key risks associated with the project.

1) Overhead and underground services
2) Street Lighting Cables
3) Working adjacent to water courses and flood plain
4) Soft ground conditions
5) Working adjacent to live highways and railway line
6) Unchartered services
7) Existing buildings with potential asbestos hazards

NOTES:

1. Do not scale from this drawing.
2. All dimensions are in metres unless otherwise stated.
3. Brookbanks Consulting Ltd has prepared this drawing for the sole use of the client. The drawing may not be relied upon by any other party without the express agreement of the client and Brookbanks Consulting Ltd. Where any data supplied by the client or from other sources has been used, it has been assumed that the information is correct. No responsibility can be accepted by Brookbanks Consulting Ltd for inaccuracies in the data supplied by any other party. The drawing has been produced based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.
4. No part of this drawing may be copied or duplicated without the express permission of Brookbanks Consulting Ltd.

KEY:

- Site Boundary
- Illustrative Attenuation SuDS Location
- Illustrative Attenuation SuDS Location
- Swales
- Piped Outfall
- Outfall Locations
- Exceedance Route for Basins not adjacent to Watercourse
- Discharge Outfall Direction

F	Further Information added	KM LW	LW 10.06.22
-	First Issue	KM DN	DN 19.03.21

BROOKBANKS

6150 Knights Court, Solihull Parkway, Birmingham, B37 7WY
T +44 (0)203 958 5400 E mail@brookbanks.com
W brookbanks.com

Hallam Land Management Ltd

Land at North West Bicester

Indicative SuDS Layout

Status		Status Date
Draft		JUN 2022
Drawn	**Checked**	**Date**
KM	DN	15.04.21
Scale	**Number**	**Rev**
1:5000	10663-DR-01	F

0 100 200 300 400 500
METRES

UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR COMMENCE SITE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT HIS OWN RISK.

Appendix B – WinDES Calculations

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.096	0.096	5.9	312.7	O K
30 min Summer	0.119	0.119	8.4	387.8	O K
60 min Summer	0.145	0.145	11.3	475.9	O K
120 min Summer	0.173	0.173	13.9	572.9	O K
180 min Summer	0.189	0.189	15.2	628.4	O K
240 min Summer	0.200	0.200	15.5	665.1	O K
360 min Summer	0.213	0.213	15.7	712.0	O K
480 min Summer	0.223	0.223	15.8	745.6	O K
600 min Summer	0.230	0.230	15.9	770.9	O K
720 min Summer	0.236	0.236	15.9	790.3	O K
960 min Summer	0.243	0.243	16.0	815.9	O K
1440 min Summer	0.249	0.249	16.0	836.0	O K
2160 min Summer	0.247	0.247	16.0	828.3	O K
2880 min Summer	0.239	0.239	16.0	801.4	O K
4320 min Summer	0.212	0.212	15.7	706.5	O K
5760 min Summer	0.190	0.190	15.3	632.3	O K
7200 min Summer	0.176	0.176	14.1	581.8	O K
8640 min Summer	0.164	0.164	13.1	541.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	205.4	26
30 min Summer	18.857	0.0	274.1	41
60 min Summer	11.811	0.0	423.8	70
120 min Summer	7.397	0.0	544.7	126
180 min Summer	5.626	0.0	628.9	184
240 min Summer	4.633	0.0	695.6	242
360 min Summer	3.524	0.0	799.9	322
480 min Summer	2.902	0.0	881.8	386
600 min Summer	2.496	0.0	950.0	452
720 min Summer	2.207	0.0	1008.9	520
960 min Summer	1.817	0.0	1106.3	658
1440 min Summer	1.380	0.0	1251.2	934
2160 min Summer	1.049	0.0	1531.7	1344
2880 min Summer	0.863	0.0	1677.6	1736
4320 min Summer	0.637	0.0	1831.2	2472
5760 min Summer	0.513	0.0	2039.8	3176
7200 min Summer	0.434	0.0	2150.6	3896
8640 min Summer	0.378	0.0	2240.0	4664

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.154	0.154	12.2	509.1	O K
15 min Winter	0.107	0.107	7.1	350.0	O K
30 min Winter	0.132	0.132	9.9	434.0	O K
60 min Winter	0.161	0.161	12.9	533.1	O K
120 min Winter	0.194	0.194	15.4	643.1	O K
180 min Winter	0.213	0.213	15.7	709.4	O K
240 min Winter	0.226	0.226	15.8	754.9	O K
360 min Winter	0.242	0.242	16.0	812.1	O K
480 min Winter	0.251	0.251	16.1	844.1	O K
600 min Winter	0.258	0.258	16.1	867.8	O K
720 min Winter	0.263	0.263	16.2	886.0	O K
960 min Winter	0.268	0.268	16.2	905.5	O K
1440 min Winter	0.269	0.269	16.2	907.0	O K
2160 min Winter	0.257	0.257	16.1	866.9	O K
2880 min Winter	0.241	0.241	16.0	809.1	O K
4320 min Winter	0.201	0.201	15.5	667.3	O K
5760 min Winter	0.176	0.176	14.1	582.0	O K
7200 min Winter	0.159	0.159	12.6	523.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	2306.1	5352
15 min Winter	30.107	0.0	238.0	26
30 min Winter	18.857	0.0	316.0	40
60 min Winter	11.811	0.0	481.6	68
120 min Winter	7.397	0.0	617.2	124
180 min Winter	5.626	0.0	711.6	180
240 min Winter	4.633	0.0	786.2	238
360 min Winter	3.524	0.0	902.9	348
480 min Winter	2.902	0.0	994.6	446
600 min Winter	2.496	0.0	1070.9	482
720 min Winter	2.207	0.0	1136.7	558
960 min Winter	1.817	0.0	1245.6	714
1440 min Winter	1.380	0.0	1407.0	1018
2160 min Winter	1.049	0.0	1720.8	1452
2880 min Winter	0.863	0.0	1885.2	1852
4320 min Winter	0.637	0.0	2060.8	2596
5760 min Winter	0.513	0.0	2288.3	3288
7200 min Winter	0.434	0.0	2413.4	4032

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.146	0.146	11.4	480.5	O K
10080 min Winter	0.136	0.136	10.3	447.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	2515.1	4752
10080 min Winter	0.337	0.0	2592.5	5456

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.610

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.870	4	8	1.870	8	12	1.870

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3190.7	1.500	5541.3

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0180-1650-1200-1650
Design Head (m)	1.200
Design Flow (l/s)	16.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	180
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	16.5	Kick-Flo®	0.814	13.7
Flush-Flo™	0.370	16.5	Mean Flow over Head Range	-	14.1

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	6.3	1.200	16.5	3.000	25.5	7.000	38.4
0.200	15.5	1.400	17.7	3.500	27.5	7.500	39.7
0.300	16.4	1.600	18.9	4.000	29.3	8.000	41.0
0.400	16.5	1.800	20.0	4.500	31.0	8.500	42.2
0.500	16.3	2.000	21.0	5.000	32.7	9.000	43.4
0.600	15.9	2.200	22.0	5.500	34.2	9.500	44.5
0.800	14.0	2.400	23.0	6.000	35.7		
1.000	15.1	2.600	23.8	6.500	37.1		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.276	0.276	16.2	933.4	O K
30 min Summer	0.323	0.323	16.4	1101.8	O K
60 min Summer	0.375	0.375	16.5	1294.0	O K
120 min Summer	0.431	0.431	16.5	1506.3	O K
180 min Summer	0.465	0.465	16.5	1635.2	O K
240 min Summer	0.488	0.488	16.5	1725.4	O K
360 min Summer	0.519	0.519	16.5	1844.9	O K
480 min Summer	0.538	0.538	16.5	1918.4	O K
600 min Summer	0.549	0.549	16.5	1964.6	O K
720 min Summer	0.556	0.556	16.5	1992.6	O K
960 min Summer	0.561	0.561	16.5	2012.4	O K
1440 min Summer	0.562	0.562	16.5	2016.8	O K
2160 min Summer	0.554	0.554	16.5	1982.4	O K
2880 min Summer	0.538	0.538	16.5	1921.4	O K
4320 min Summer	0.480	0.480	16.5	1693.7	O K
5760 min Summer	0.426	0.426	16.5	1484.7	O K
7200 min Summer	0.377	0.377	16.5	1300.4	O K
8640 min Summer	0.334	0.334	16.4	1141.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	763.5	26
30 min Summer	53.466	0.0	911.0	41
60 min Summer	31.728	0.0	1233.0	70
120 min Summer	18.829	0.0	1468.4	130
180 min Summer	13.876	0.0	1623.2	188
240 min Summer	11.174	0.0	1740.7	248
360 min Summer	8.234	0.0	1915.8	366
480 min Summer	6.631	0.0	2044.4	484
600 min Summer	5.605	0.0	2143.9	602
720 min Summer	4.887	0.0	2221.9	722
960 min Summer	3.933	0.0	2326.2	912
1440 min Summer	2.896	0.0	2356.4	1140
2160 min Summer	2.132	0.0	3139.9	1524
2880 min Summer	1.716	0.0	3356.0	1936
4320 min Summer	1.226	0.0	3547.5	2732
5760 min Summer	0.966	0.0	3866.7	3520
7200 min Summer	0.803	0.0	4010.7	4256
8640 min Summer	0.690	0.0	4124.6	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.297	0.297	16.3	1008.2	O K
15 min Winter	0.308	0.308	16.4	1046.6	O K
30 min Winter	0.359	0.359	16.5	1236.2	O K
60 min Winter	0.417	0.417	16.5	1453.1	O K
120 min Winter	0.480	0.480	16.5	1694.4	O K
180 min Winter	0.518	0.518	16.5	1842.3	O K
240 min Winter	0.545	0.545	16.5	1947.1	O K
360 min Winter	0.580	0.580	16.5	2088.6	O K
480 min Winter	0.603	0.603	16.5	2178.9	O K
600 min Winter	0.617	0.617	16.5	2239.2	O K
720 min Winter	0.627	0.627	16.5	2279.5	O K
960 min Winter	0.637	0.637	16.5	2319.1	O K
1440 min Winter	0.635	0.635	16.5	2310.2	O K
2160 min Winter	0.619	0.619	16.5	2245.3	O K
2880 min Winter	0.595	0.595	16.5	2147.1	O K
4320 min Winter	0.510	0.510	16.5	1809.1	O K
5760 min Winter	0.429	0.429	16.5	1495.6	O K
7200 min Winter	0.357	0.357	16.5	1226.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	4205.8	5664
15 min Winter	90.095	0.0	859.9	26
30 min Winter	53.466	0.0	1018.4	41
60 min Winter	31.728	0.0	1385.4	70
120 min Winter	18.829	0.0	1646.4	128
180 min Winter	13.876	0.0	1816.8	186
240 min Winter	11.174	0.0	1945.1	244
360 min Winter	8.234	0.0	2132.9	360
480 min Winter	6.631	0.0	2266.0	476
600 min Winter	5.605	0.0	2362.5	590
720 min Winter	4.887	0.0	2430.0	704
960 min Winter	3.933	0.0	2488.3	926
1440 min Winter	2.896	0.0	2403.8	1336
2160 min Winter	2.132	0.0	3513.7	1660
2880 min Winter	1.716	0.0	3751.1	2112
4320 min Winter	1.226	0.0	3951.0	2984
5760 min Winter	0.966	0.0	4334.0	3760
7200 min Winter	0.803	0.0	4497.1	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.296	0.296	16.3	1006.6	O K
10080 min Winter	0.249	0.249	16.0	835.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	4627.0	5192
10080 min Winter	0.608	0.0	4723.2	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.610

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.870	4	8	1.870	8	12	1.870

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3190.7	1.500	5541.3

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0180-1650-1200-1650
Design Head (m)	1.200
Design Flow (l/s)	16.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	180
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	16.5	Kick-Flo®	0.814	13.7
Flush-Flo™	0.370	16.5	Mean Flow over Head Range	-	14.1

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	6.3	1.200	16.5	3.000	25.5	7.000	38.4
0.200	15.5	1.400	17.7	3.500	27.5	7.500	39.7
0.300	16.4	1.600	18.9	4.000	29.3	8.000	41.0
0.400	16.5	1.800	20.0	4.500	31.0	8.500	42.2
0.500	16.3	2.000	21.0	5.000	32.7	9.000	43.4
0.600	15.9	2.200	22.0	5.500	34.2	9.500	44.5
0.800	14.0	2.400	23.0	6.000	35.7		
1.000	15.1	2.600	23.8	6.500	37.1		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.546	0.546	16.5	1949.7	O K
30 min Summer	0.623	0.623	16.5	2263.2	O K
60 min Summer	0.709	0.709	16.5	2619.3	O K
120 min Summer	0.802	0.802	16.5	3017.3	O K
180 min Summer	0.858	0.858	16.5	3266.1	O K
240 min Summer	0.898	0.898	16.5	3445.2	O K
360 min Summer	0.953	0.953	16.5	3694.4	O K
480 min Summer	0.989	0.989	16.5	3863.0	O K
600 min Summer	1.015	1.015	16.5	3984.1	O K
720 min Summer	1.034	1.034	16.5	4073.7	O K
960 min Summer	1.058	1.058	16.5	4188.0	O K
1440 min Summer	1.076	1.076	16.5	4274.0	O K
2160 min Summer	1.067	1.067	16.5	4230.4	O K
2880 min Summer	1.049	1.049	16.5	4146.6	O K
4320 min Summer	0.978	0.978	16.5	3812.9	O K
5760 min Summer	0.914	0.914	16.5	3516.4	O K
7200 min Summer	0.852	0.852	16.5	3236.6	O K
8640 min Summer	0.785	0.785	16.5	2945.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	1389.0	27
30 min Summer	108.845	0.0	1391.2	42
60 min Summer	63.353	0.0	2418.0	72
120 min Summer	36.874	0.0	2653.0	130
180 min Summer	26.867	0.0	2645.5	190
240 min Summer	21.462	0.0	2605.7	250
360 min Summer	15.638	0.0	2542.3	368
480 min Summer	12.492	0.0	2496.8	488
600 min Summer	10.494	0.0	2461.7	608
720 min Summer	9.102	0.0	2433.1	726
960 min Summer	7.267	0.0	2387.7	966
1440 min Summer	5.290	0.0	2330.6	1442
2160 min Summer	3.852	0.0	4923.3	2056
2880 min Summer	3.075	0.0	4747.4	2372
4320 min Summer	2.173	0.0	4339.7	3120
5760 min Summer	1.698	0.0	6792.5	3928
7200 min Summer	1.402	0.0	6999.4	4760
8640 min Summer	1.200	0.0	7167.0	5544

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.721	0.721	16.5	2670.4	O K
15 min Winter	0.604	0.604	16.5	2185.5	O K
30 min Winter	0.690	0.690	16.5	2537.9	O K
60 min Winter	0.784	0.784	16.5	2939.2	O K
120 min Winter	0.886	0.886	16.5	3389.1	O K
180 min Winter	0.947	0.947	16.5	3669.8	O K
240 min Winter	0.991	0.991	16.5	3873.3	O K
360 min Winter	1.052	1.052	16.5	4159.7	O K
480 min Winter	1.093	1.093	16.5	4356.3	O K
600 min Winter	1.122	1.122	16.5	4500.1	O K
720 min Winter	1.144	1.144	16.5	4608.7	O K
960 min Winter	1.174	1.174	16.5	4753.8	O K
1440 min Winter	1.200	1.200	16.5	4885.7	Flood Risk
2160 min Winter	1.201	1.201	16.5	4889.0	Flood Risk
2880 min Winter	1.180	1.180	16.5	4785.2	O K
4320 min Winter	1.094	1.094	16.5	4364.2	O K
5760 min Winter	1.013	1.013	16.5	3973.6	O K
7200 min Winter	0.930	0.930	16.5	3591.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	7294.6	6272
15 min Winter	187.006	0.0	1397.8	27
30 min Winter	108.845	0.0	1378.7	41
60 min Winter	63.353	0.0	2617.8	70
120 min Winter	36.874	0.0	2649.5	128
180 min Winter	26.867	0.0	2599.8	188
240 min Winter	21.462	0.0	2563.9	246
360 min Winter	15.638	0.0	2518.9	364
480 min Winter	12.492	0.0	2492.0	480
600 min Winter	10.494	0.0	2474.7	598
720 min Winter	9.102	0.0	2464.3	714
960 min Winter	7.267	0.0	2459.5	946
1440 min Winter	5.290	0.0	2453.7	1404
2160 min Winter	3.852	0.0	4989.3	2064
2880 min Winter	3.075	0.0	4847.5	2684
4320 min Winter	2.173	0.0	4525.7	3332
5760 min Winter	1.698	0.0	7600.4	4264
7200 min Winter	1.402	0.0	7822.7	5184

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.845	0.845	16.5	3208.4	O K
10080 min Winter	0.747	0.747	16.5	2779.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	7992.1	6064
10080 min Winter	1.051	0.0	8123.6	6864

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.610

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.870	4	8	1.870	8	12	1.870

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3190.7	1.500	5541.3

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0180-1650-1200-1650
Design Head (m)	1.200
Design Flow (l/s)	16.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	180
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	16.5	Kick-Flo®	0.814	13.7
Flush-Flo™	0.370	16.5	Mean Flow over Head Range	-	14.1

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	6.3	1.200	16.5	3.000	25.5	7.000	38.4
0.200	15.5	1.400	17.7	3.500	27.5	7.500	39.7
0.300	16.4	1.600	18.9	4.000	29.3	8.000	41.0
0.400	16.5	1.800	20.0	4.500	31.0	8.500	42.2
0.500	16.3	2.000	21.0	5.000	32.7	9.000	43.4
0.600	15.9	2.200	22.0	5.500	34.2	9.500	44.5
0.800	14.0	2.400	23.0	6.000	35.7		
1.000	15.1	2.600	23.8	6.500	37.1		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.088	0.088	5.6	435.9	O K
30 min Summer	0.109	0.109	8.2	542.2	O K
60 min Summer	0.134	0.134	11.6	668.8	O K
120 min Summer	0.162	0.162	15.5	811.1	O K
180 min Summer	0.178	0.178	17.6	895.2	O K
240 min Summer	0.189	0.189	18.9	951.3	O K
360 min Summer	0.202	0.202	20.2	1017.7	O K
480 min Summer	0.211	0.211	21.1	1063.2	O K
600 min Summer	0.218	0.218	21.7	1099.2	O K
720 min Summer	0.223	0.223	21.8	1129.1	O K
960 min Summer	0.232	0.232	21.9	1171.4	O K
1440 min Summer	0.240	0.240	22.0	1212.9	O K
2160 min Summer	0.241	0.241	22.1	1220.3	O K
2880 min Summer	0.237	0.237	22.0	1197.8	O K
4320 min Summer	0.216	0.216	21.7	1090.7	O K
5760 min Summer	0.200	0.200	20.1	1008.5	O K
7200 min Summer	0.187	0.187	18.6	940.4	O K
8640 min Summer	0.176	0.176	17.4	884.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	239.1	27
30 min Summer	18.857	0.0	325.9	41
60 min Summer	11.811	0.0	543.6	70
120 min Summer	7.397	0.0	707.1	128
180 min Summer	5.626	0.0	821.4	184
240 min Summer	4.633	0.0	911.8	242
360 min Summer	3.524	0.0	1053.5	342
480 min Summer	2.902	0.0	1164.7	392
600 min Summer	2.496	0.0	1257.1	454
720 min Summer	2.207	0.0	1336.3	522
960 min Summer	1.817	0.0	1466.3	660
1440 min Summer	1.380	0.0	1655.6	936
2160 min Summer	1.049	0.0	2085.4	1344
2880 min Summer	0.863	0.0	2282.1	1736
4320 min Summer	0.637	0.0	2479.2	2476
5760 min Summer	0.513	0.0	2808.2	3232
7200 min Summer	0.434	0.0	2957.8	3968
8640 min Summer	0.378	0.0	3075.7	4672

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.167	0.167	16.2	838.0	O K
15 min Winter	0.098	0.098	6.9	487.9	O K
30 min Winter	0.122	0.122	10.0	606.7	O K
60 min Winter	0.150	0.150	13.8	748.4	O K
120 min Winter	0.181	0.181	17.9	908.4	O K
180 min Winter	0.199	0.199	20.0	1004.3	O K
240 min Winter	0.212	0.212	21.2	1068.9	O K
360 min Winter	0.228	0.228	21.8	1150.8	O K
480 min Winter	0.237	0.237	22.0	1199.8	O K
600 min Winter	0.244	0.244	22.1	1236.3	O K
720 min Winter	0.250	0.250	22.2	1265.9	O K
960 min Winter	0.257	0.257	22.2	1301.7	O K
1440 min Winter	0.260	0.260	22.3	1319.9	O K
2160 min Winter	0.253	0.253	22.2	1285.4	O K
2880 min Winter	0.241	0.241	22.1	1222.6	O K
4320 min Winter	0.210	0.210	21.1	1060.9	O K
5760 min Winter	0.189	0.189	18.9	951.3	O K
7200 min Winter	0.173	0.173	17.0	868.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	3158.3	5440
15 min Winter	30.107	0.0	280.2	26
30 min Winter	18.857	0.0	379.7	40
60 min Winter	11.811	0.0	621.8	68
120 min Winter	7.397	0.0	806.0	124
180 min Winter	5.626	0.0	934.5	182
240 min Winter	4.633	0.0	1036.1	238
360 min Winter	3.524	0.0	1195.1	348
480 min Winter	2.902	0.0	1319.4	448
600 min Winter	2.496	0.0	1422.6	484
720 min Winter	2.207	0.0	1511.1	560
960 min Winter	1.817	0.0	1656.4	716
1440 min Winter	1.380	0.0	1868.0	1018
2160 min Winter	1.049	0.0	2346.8	1452
2880 min Winter	0.863	0.0	2569.0	1852
4320 min Winter	0.637	0.0	2795.1	2600
5760 min Winter	0.513	0.0	3152.9	3344
7200 min Winter	0.434	0.0	3322.1	4104

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.161	0.161	15.4	805.7	O K
10080 min Winter	0.151	0.151	14.0	756.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	3456.8	4840
10080 min Winter	0.337	0.0	3554.3	5552

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 7.790

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	2.597	4	8	2.597	8	12	2.597

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4910.9	1.500	6971.5

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0208-2290-1200-2290
Design Head (m)	1.200
Design Flow (l/s)	22.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	208
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	22.9	Kick-Flo®	0.840	19.3
Flush-Flo™	0.387	22.9	Mean Flow over Head Range	-	19.5

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	7.1	1.200	22.9	3.000	35.5	7.000	53.5
0.200	20.0	1.400	24.6	3.500	38.3	7.500	55.3
0.300	22.6	1.600	26.3	4.000	40.8	8.000	57.1
0.400	22.9	1.800	27.8	4.500	43.2	8.500	58.8
0.500	22.7	2.000	29.2	5.000	45.5	9.000	60.5
0.600	22.2	2.200	30.6	5.500	47.6	9.500	62.1
0.800	20.3	2.400	31.9	6.000	49.7		
1.000	21.0	2.600	33.2	6.500	51.6		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.256	0.256	22.2	1297.8	O K
30 min Summer	0.300	0.300	22.6	1532.0	O K
60 min Summer	0.351	0.351	22.8	1799.7	O K
120 min Summer	0.406	0.406	22.9	2096.6	O K
180 min Summer	0.439	0.439	22.9	2277.8	O K
240 min Summer	0.462	0.462	22.9	2405.3	O K
360 min Summer	0.493	0.493	22.9	2575.6	O K
480 min Summer	0.512	0.512	22.9	2681.9	O K
600 min Summer	0.524	0.524	22.9	2750.2	O K
720 min Summer	0.532	0.532	22.9	2793.1	O K
960 min Summer	0.538	0.538	22.9	2829.0	O K
1440 min Summer	0.542	0.542	22.9	2852.0	O K
2160 min Summer	0.538	0.538	22.9	2825.4	O K
2880 min Summer	0.525	0.525	22.9	2756.8	O K
4320 min Summer	0.472	0.472	22.9	2462.5	O K
5760 min Summer	0.422	0.422	22.9	2185.3	O K
7200 min Summer	0.376	0.376	22.9	1938.3	O K
8640 min Summer	0.336	0.336	22.8	1724.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	976.2	26
30 min Summer	53.466	0.0	1176.7	41
60 min Summer	31.728	0.0	1650.6	70
120 min Summer	18.829	0.0	1971.9	130
180 min Summer	13.876	0.0	2182.6	188
240 min Summer	11.174	0.0	2342.0	248
360 min Summer	8.234	0.0	2578.7	366
480 min Summer	6.631	0.0	2751.8	484
600 min Summer	5.605	0.0	2885.3	602
720 min Summer	4.887	0.0	2990.0	722
960 min Summer	3.933	0.0	3132.3	902
1440 min Summer	2.896	0.0	3200.5	1138
2160 min Summer	2.132	0.0	4300.8	1520
2880 min Summer	1.716	0.0	4590.1	1936
4320 min Summer	1.226	0.0	4829.7	2728
5760 min Summer	0.966	0.0	5341.9	3520
7200 min Summer	0.803	0.0	5537.0	4256
8640 min Summer	0.690	0.0	5687.3	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.302	0.302	22.7	1542.9	O K
15 min Winter	0.286	0.286	22.5	1454.9	O K
30 min Winter	0.335	0.335	22.8	1718.4	O K
60 min Winter	0.392	0.392	22.9	2020.6	O K
120 min Winter	0.453	0.453	22.9	2357.8	O K
180 min Winter	0.491	0.491	22.9	2565.3	O K
240 min Winter	0.517	0.517	22.9	2712.8	O K
360 min Winter	0.553	0.553	22.9	2913.2	O K
480 min Winter	0.576	0.576	22.9	3042.4	O K
600 min Winter	0.591	0.591	22.9	3129.6	O K
720 min Winter	0.602	0.602	22.9	3189.0	O K
960 min Winter	0.613	0.613	22.9	3250.8	O K
1440 min Winter	0.613	0.613	22.9	3251.6	O K
2160 min Winter	0.601	0.601	22.9	3184.3	O K
2880 min Winter	0.580	0.580	22.9	3065.0	O K
4320 min Winter	0.501	0.501	22.9	2622.8	O K
5760 min Winter	0.426	0.426	22.9	2206.1	O K
7200 min Winter	0.359	0.359	22.9	1844.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	5786.9	5664
15 min Winter	90.095	0.0	1107.2	26
30 min Winter	53.466	0.0	1323.7	41
60 min Winter	31.728	0.0	1859.1	70
120 min Winter	18.829	0.0	2215.0	128
180 min Winter	13.876	0.0	2446.7	186
240 min Winter	11.174	0.0	2620.5	244
360 min Winter	8.234	0.0	2874.6	360
480 min Winter	6.631	0.0	3054.8	476
600 min Winter	5.605	0.0	3187.0	590
720 min Winter	4.887	0.0	3282.7	702
960 min Winter	3.933	0.0	3382.6	924
1440 min Winter	2.896	0.0	3301.7	1332
2160 min Winter	2.132	0.0	4813.7	1652
2880 min Winter	1.716	0.0	5130.5	2112
4320 min Winter	1.226	0.0	5377.3	2984
5760 min Winter	0.966	0.0	5989.9	3760
7200 min Winter	0.803	0.0	6211.7	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.303	0.303	22.7	1547.6	O K
10080 min Winter	0.259	0.259	22.3	1314.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	6384.3	5192
10080 min Winter	0.608	0.0	6504.2	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 7.790

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	2.597	4	8	2.597	8	12	2.597

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4910.9	1.500	6971.5

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0208-2290-1200-2290
Design Head (m)	1.200
Design Flow (l/s)	22.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	208
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	22.9	Kick-Flo®	0.840	19.3
Flush-Flo™	0.387	22.9	Mean Flow over Head Range	-	19.5

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	7.1	1.200	22.9	3.000	35.5	7.000	53.5
0.200	20.0	1.400	24.6	3.500	38.3	7.500	55.3
0.300	22.6	1.600	26.3	4.000	40.8	8.000	57.1
0.400	22.9	1.800	27.8	4.500	43.2	8.500	58.8
0.500	22.7	2.000	29.2	5.000	45.5	9.000	60.5
0.600	22.2	2.200	30.6	5.500	47.6	9.500	62.1
0.800	20.3	2.400	31.9	6.000	49.7		
1.000	21.0	2.600	33.2	6.500	51.6		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.517	0.517	22.9	2708.2	O K
30 min Summer	0.594	0.594	22.9	3143.7	O K
60 min Summer	0.680	0.680	22.9	3638.9	O K
120 min Summer	0.775	0.775	22.9	4192.4	O K
180 min Summer	0.833	0.833	22.9	4539.5	O K
240 min Summer	0.875	0.875	22.9	4792.2	O K
360 min Summer	0.932	0.932	22.9	5145.3	O K
480 min Summer	0.971	0.971	22.9	5385.4	O K
600 min Summer	0.999	0.999	22.9	5558.9	O K
720 min Summer	1.020	1.020	22.9	5688.4	O K
960 min Summer	1.047	1.047	22.9	5856.7	O K
1440 min Summer	1.068	1.068	22.9	5993.2	O K
2160 min Summer	1.062	1.062	22.9	5954.1	O K
2880 min Summer	1.046	1.046	22.9	5853.9	O K
4320 min Summer	0.975	0.975	22.9	5411.4	O K
5760 min Summer	0.910	0.910	22.9	5006.1	O K
7200 min Summer	0.844	0.844	22.9	4608.6	O K
8640 min Summer	0.776	0.776	22.9	4199.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	1893.5	27
30 min Summer	108.845	0.0	1936.4	42
60 min Summer	63.353	0.0	3272.0	72
120 min Summer	36.874	0.0	3640.3	130
180 min Summer	26.867	0.0	3718.4	190
240 min Summer	21.462	0.0	3667.1	250
360 min Summer	15.638	0.0	3569.6	370
480 min Summer	12.492	0.0	3495.0	488
600 min Summer	10.494	0.0	3435.7	608
720 min Summer	9.102	0.0	3386.0	726
960 min Summer	7.267	0.0	3303.9	966
1440 min Summer	5.290	0.0	3180.5	1442
2160 min Summer	3.852	0.0	6796.4	2056
2880 min Summer	3.075	0.0	6537.1	2388
4320 min Summer	2.173	0.0	5940.5	3120
5760 min Summer	1.698	0.0	9385.8	3928
7200 min Summer	1.402	0.0	9666.0	4768
8640 min Summer	1.200	0.0	9889.1	5536

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.714	0.714	22.9	3833.9	O K
15 min Winter	0.575	0.575	22.9	3035.5	O K
30 min Winter	0.661	0.661	22.9	3525.0	O K
60 min Winter	0.756	0.756	22.9	4082.4	O K
120 min Winter	0.861	0.861	22.9	4709.3	O K
180 min Winter	0.925	0.925	22.9	5102.2	O K
240 min Winter	0.972	0.972	22.9	5387.4	O K
360 min Winter	1.036	1.036	22.9	5789.9	O K
480 min Winter	1.080	1.080	22.9	6067.2	O K
600 min Winter	1.112	1.112	22.9	6271.1	O K
720 min Winter	1.136	1.136	22.9	6425.8	O K
960 min Winter	1.168	1.168	22.9	6635.0	O K
1440 min Winter	1.198	1.198	22.9	6832.1	O K
2160 min Winter	1.202	1.202	22.9	6854.9	Flood Risk
2880 min Winter	1.182	1.182	22.9	6726.4	O K
4320 min Winter	1.095	1.095	22.9	6165.6	O K
5760 min Winter	1.011	1.011	22.9	5635.7	O K
7200 min Winter	0.926	0.926	22.9	5108.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	10046.6	6264
15 min Winter	187.006	0.0	1942.1	27
30 min Winter	108.845	0.0	1930.7	41
60 min Winter	63.353	0.0	3569.0	70
120 min Winter	36.874	0.0	3729.7	128
180 min Winter	26.867	0.0	3659.2	188
240 min Winter	21.462	0.0	3603.5	246
360 min Winter	15.638	0.0	3527.6	364
480 min Winter	12.492	0.0	3478.3	480
600 min Winter	10.494	0.0	3442.6	598
720 min Winter	9.102	0.0	3415.6	714
960 min Winter	7.267	0.0	3379.6	946
1440 min Winter	5.290	0.0	3349.9	1404
2160 min Winter	3.852	0.0	6903.5	2064
2880 min Winter	3.075	0.0	6685.3	2684
4320 min Winter	2.173	0.0	6193.7	3332
5760 min Winter	1.698	0.0	10498.8	4264
7200 min Winter	1.402	0.0	10794.2	5184

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.835	0.835	22.9	4553.4	O K
10080 min Winter	0.737	0.737	22.9	3973.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	11021.3	6056
10080 min Winter	1.051	0.0	11183.2	6848

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 7.790

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	2.597	4	8	2.597	8	12	2.597

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4910.9	1.500	6971.5

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0208-2290-1200-2290
Design Head (m)	1.200
Design Flow (l/s)	22.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	208
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	22.9	Kick-Flo®	0.840	19.3
Flush-Flo™	0.387	22.9	Mean Flow over Head Range	-	19.5

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	7.1	1.200	22.9	3.000	35.5	7.000	53.5
0.200	20.0	1.400	24.6	3.500	38.3	7.500	55.3
0.300	22.6	1.600	26.3	4.000	40.8	8.000	57.1
0.400	22.9	1.800	27.8	4.500	43.2	8.500	58.8
0.500	22.7	2.000	29.2	5.000	45.5	9.000	60.5
0.600	22.2	2.200	30.6	5.500	47.6	9.500	62.1
0.800	20.3	2.400	31.9	6.000	49.7		
1.000	21.0	2.600	33.2	6.500	51.6		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.090	0.090	5.1	281.0	O K
30 min Summer	0.112	0.112	7.3	348.7	O K
60 min Summer	0.137	0.137	9.8	428.1	O K
120 min Summer	0.164	0.164	12.2	515.8	O K
180 min Summer	0.180	0.180	13.4	566.2	O K
240 min Summer	0.190	0.190	13.8	599.2	O K
360 min Summer	0.203	0.203	14.0	641.6	O K
480 min Summer	0.212	0.212	14.1	672.0	O K
600 min Summer	0.219	0.219	14.2	694.9	O K
720 min Summer	0.225	0.225	14.2	712.7	O K
960 min Summer	0.232	0.232	14.3	736.3	O K
1440 min Summer	0.238	0.238	14.3	755.5	O K
2160 min Summer	0.236	0.236	14.3	750.0	O K
2880 min Summer	0.229	0.229	14.3	726.9	O K
4320 min Summer	0.203	0.203	14.0	643.0	O K
5760 min Summer	0.183	0.183	13.7	577.0	O K
7200 min Summer	0.169	0.169	12.6	531.5	O K
8640 min Summer	0.158	0.158	11.7	495.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	181.3	26
30 min Summer	18.857	0.0	242.6	41
60 min Summer	11.811	0.0	377.9	70
120 min Summer	7.397	0.0	486.3	126
180 min Summer	5.626	0.0	561.8	184
240 min Summer	4.633	0.0	621.5	242
360 min Summer	3.524	0.0	715.0	324
480 min Summer	2.902	0.0	788.5	388
600 min Summer	2.496	0.0	849.6	452
720 min Summer	2.207	0.0	902.3	520
960 min Summer	1.817	0.0	989.4	660
1440 min Summer	1.380	0.0	1118.8	936
2160 min Summer	1.049	0.0	1373.5	1344
2880 min Summer	0.863	0.0	1504.2	1736
4320 min Summer	0.637	0.0	1641.3	2476
5760 min Summer	0.513	0.0	1831.0	3176
7200 min Summer	0.434	0.0	1930.3	3904
8640 min Summer	0.378	0.0	2010.2	4664

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.148	0.148	10.9	465.8	O K
15 min Winter	0.101	0.101	6.2	314.6	O K
30 min Winter	0.125	0.125	8.6	390.2	O K
60 min Winter	0.153	0.153	11.3	479.5	O K
120 min Winter	0.184	0.184	13.7	578.8	O K
180 min Winter	0.202	0.202	14.0	638.5	O K
240 min Winter	0.215	0.215	14.1	679.8	O K
360 min Winter	0.231	0.231	14.3	731.7	O K
480 min Winter	0.239	0.239	14.3	760.9	O K
600 min Winter	0.246	0.246	14.4	782.3	O K
720 min Winter	0.251	0.251	14.4	799.1	O K
960 min Winter	0.257	0.257	14.5	817.3	O K
1440 min Winter	0.257	0.257	14.5	820.1	O K
2160 min Winter	0.247	0.247	14.4	785.9	O K
2880 min Winter	0.232	0.232	14.3	735.3	O K
4320 min Winter	0.193	0.193	13.8	609.5	O K
5760 min Winter	0.169	0.169	12.6	532.6	O K
7200 min Winter	0.153	0.153	11.3	479.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	2069.0	5352
15 min Winter	30.107	0.0	210.4	26
30 min Winter	18.857	0.0	280.1	40
60 min Winter	11.811	0.0	429.7	68
120 min Winter	7.397	0.0	551.3	124
180 min Winter	5.626	0.0	636.0	180
240 min Winter	4.633	0.0	702.8	238
360 min Winter	3.524	0.0	807.5	348
480 min Winter	2.902	0.0	889.7	448
600 min Winter	2.496	0.0	958.0	482
720 min Winter	2.207	0.0	1016.9	560
960 min Winter	1.817	0.0	1114.3	716
1440 min Winter	1.380	0.0	1258.4	1018
2160 min Winter	1.049	0.0	1543.2	1452
2880 min Winter	0.863	0.0	1690.6	1852
4320 min Winter	0.637	0.0	1847.4	2596
5760 min Winter	0.513	0.0	2054.3	3296
7200 min Winter	0.434	0.0	2166.4	4040

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.141	0.141	10.2	440.3	O K
10080 min Winter	0.131	0.131	9.3	410.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	2257.3	4752
10080 min Winter	0.337	0.0	2326.2	5448

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.040

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.680	4	8	1.680	8	12	1.680

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3071.6	1.500	4524.4

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0171-1480-1200-1480
Design Head (m)	1.200
Design Flow (l/s)	14.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	171
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	14.8	Kick-Flo®	0.805	12.3
Flush-Flo™	0.366	14.8	Mean Flow over Head Range	-	12.7

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	6.1	1.200	14.8	3.000	22.9	7.000	34.4
0.200	13.9	1.400	15.9	3.500	24.7	7.500	35.6
0.300	14.7	1.600	17.0	4.000	26.3	8.000	36.7
0.400	14.8	1.800	17.9	4.500	27.8	8.500	37.8
0.500	14.6	2.000	18.9	5.000	29.3	9.000	38.9
0.600	14.2	2.200	19.7	5.500	30.6	9.500	39.9
0.800	12.4	2.400	20.6	6.000	32.0		
1.000	13.6	2.600	21.4	6.500	33.2		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.263	0.263	14.5	838.7	O K
30 min Summer	0.309	0.309	14.7	990.1	O K
60 min Summer	0.360	0.360	14.8	1162.8	O K
120 min Summer	0.416	0.416	14.8	1353.7	O K
180 min Summer	0.449	0.449	14.8	1469.7	O K
240 min Summer	0.472	0.472	14.8	1550.9	O K
360 min Summer	0.503	0.503	14.8	1658.7	O K
480 min Summer	0.522	0.522	14.8	1725.0	O K
600 min Summer	0.534	0.534	14.8	1766.9	O K
720 min Summer	0.541	0.541	14.8	1792.4	O K
960 min Summer	0.546	0.546	14.8	1810.9	O K
1440 min Summer	0.547	0.547	14.8	1816.1	O K
2160 min Summer	0.539	0.539	14.8	1786.9	O K
2880 min Summer	0.524	0.524	14.8	1733.3	O K
4320 min Summer	0.467	0.467	14.8	1530.5	O K
5760 min Summer	0.413	0.413	14.8	1343.8	O K
7200 min Summer	0.365	0.365	14.8	1179.4	O K
8640 min Summer	0.323	0.323	14.7	1037.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	680.6	26
30 min Summer	53.466	0.0	812.6	41
60 min Summer	31.728	0.0	1103.8	70
120 min Summer	18.829	0.0	1314.9	130
180 min Summer	13.876	0.0	1453.7	188
240 min Summer	11.174	0.0	1559.0	248
360 min Summer	8.234	0.0	1715.8	366
480 min Summer	6.631	0.0	1830.9	484
600 min Summer	5.605	0.0	1919.8	602
720 min Summer	4.887	0.0	1989.5	722
960 min Summer	3.933	0.0	2082.4	912
1440 min Summer	2.896	0.0	2109.5	1140
2160 min Summer	2.132	0.0	2817.1	1524
2880 min Summer	1.716	0.0	3010.6	1936
4320 min Summer	1.226	0.0	3180.6	2732
5760 min Summer	0.966	0.0	3472.1	3520
7200 min Summer	0.803	0.0	3601.2	4256
8640 min Summer	0.690	0.0	3703.0	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.287	0.287	14.6	918.2	O K
15 min Winter	0.294	0.294	14.7	940.4	O K
30 min Winter	0.344	0.344	14.8	1110.7	O K
60 min Winter	0.402	0.402	14.8	1305.7	O K
120 min Winter	0.464	0.464	14.8	1522.7	O K
180 min Winter	0.502	0.502	14.8	1655.7	O K
240 min Winter	0.529	0.529	14.8	1750.1	O K
360 min Winter	0.565	0.565	14.8	1877.5	O K
480 min Winter	0.587	0.587	14.8	1959.1	O K
600 min Winter	0.602	0.602	14.8	2013.6	O K
720 min Winter	0.612	0.612	14.8	2050.1	O K
960 min Winter	0.622	0.622	14.8	2086.4	O K
1440 min Winter	0.621	0.621	14.8	2079.6	O K
2160 min Winter	0.605	0.605	14.8	2023.1	O K
2880 min Winter	0.581	0.581	14.8	1936.3	O K
4320 min Winter	0.496	0.496	14.8	1635.0	O K
5760 min Winter	0.416	0.416	14.8	1355.2	O K
7200 min Winter	0.346	0.346	14.8	1115.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	3775.2	5664
15 min Winter	90.095	0.0	766.8	26
30 min Winter	53.466	0.0	908.8	41
60 min Winter	31.728	0.0	1240.5	70
120 min Winter	18.829	0.0	1474.5	128
180 min Winter	13.876	0.0	1627.3	186
240 min Winter	11.174	0.0	1742.2	244
360 min Winter	8.234	0.0	1910.4	360
480 min Winter	6.631	0.0	2029.3	476
600 min Winter	5.605	0.0	2115.6	590
720 min Winter	4.887	0.0	2175.9	704
960 min Winter	3.933	0.0	2228.3	926
1440 min Winter	2.896	0.0	2154.0	1336
2160 min Winter	2.132	0.0	3152.4	1660
2880 min Winter	1.716	0.0	3364.9	2112
4320 min Winter	1.226	0.0	3541.9	2984
5760 min Winter	0.966	0.0	3891.8	3760
7200 min Winter	0.803	0.0	4038.1	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.287	0.287	14.6	918.9	O K
10080 min Winter	0.241	0.241	14.4	765.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	4154.4	5192
10080 min Winter	0.608	0.0	4239.9	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.040

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.680	4	8	1.680	8	12	1.680

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3071.6	1.500	4524.4

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0171-1480-1200-1480
Design Head (m)	1.200
Design Flow (l/s)	14.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	171
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	14.8	Kick-Flo®	0.805	12.3
Flush-Flo™	0.366	14.8	Mean Flow over Head Range	-	12.7

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	6.1	1.200	14.8	3.000	22.9	7.000	34.4
0.200	13.9	1.400	15.9	3.500	24.7	7.500	35.6
0.300	14.7	1.600	17.0	4.000	26.3	8.000	36.7
0.400	14.8	1.800	17.9	4.500	27.8	8.500	37.8
0.500	14.6	2.000	18.9	5.000	29.3	9.000	38.9
0.600	14.2	2.200	19.7	5.500	30.6	9.500	39.9
0.800	12.4	2.400	20.6	6.000	32.0		
1.000	13.6	2.600	21.4	6.500	33.2		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.529	0.529	14.8	1751.7	O K
30 min Summer	0.608	0.608	14.8	2033.3	O K
60 min Summer	0.695	0.695	14.8	2353.3	O K
120 min Summer	0.790	0.790	14.8	2711.2	O K
180 min Summer	0.849	0.849	14.8	2935.1	O K
240 min Summer	0.890	0.890	14.8	3096.4	O K
360 min Summer	0.948	0.948	14.8	3320.9	O K
480 min Summer	0.986	0.986	14.8	3472.9	O K
600 min Summer	1.013	1.013	14.8	3582.1	O K
720 min Summer	1.033	1.033	14.8	3663.0	O K
960 min Summer	1.059	1.059	14.8	3766.6	O K
1440 min Summer	1.078	1.078	14.8	3845.3	O K
2160 min Summer	1.069	1.069	14.8	3808.2	O K
2880 min Summer	1.051	1.051	14.8	3734.4	O K
4320 min Summer	0.977	0.977	14.8	3437.3	O K
5760 min Summer	0.910	0.910	14.8	3172.5	O K
7200 min Summer	0.845	0.845	14.8	2922.0	O K
8640 min Summer	0.777	0.777	14.8	2660.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	1243.9	27
30 min Summer	108.845	0.0	1248.7	42
60 min Summer	63.353	0.0	2166.1	72
120 min Summer	36.874	0.0	2377.5	130
180 min Summer	26.867	0.0	2371.9	190
240 min Summer	21.462	0.0	2335.9	250
360 min Summer	15.638	0.0	2277.9	368
480 min Summer	12.492	0.0	2235.9	488
600 min Summer	10.494	0.0	2203.6	608
720 min Summer	9.102	0.0	2177.3	726
960 min Summer	7.267	0.0	2135.8	966
1440 min Summer	5.290	0.0	2084.2	1442
2160 min Summer	3.852	0.0	4408.6	2056
2880 min Summer	3.075	0.0	4249.7	2376
4320 min Summer	2.173	0.0	3880.0	3120
5760 min Summer	1.698	0.0	6099.1	3928
7200 min Summer	1.402	0.0	6284.1	4760
8640 min Summer	1.200	0.0	6434.0	5544

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.711	0.711	14.8	2412.5	O K
15 min Winter	0.589	0.589	14.8	1963.5	O K
30 min Winter	0.675	0.675	14.8	2280.2	O K
60 min Winter	0.772	0.772	14.8	2640.8	O K
120 min Winter	0.877	0.877	14.8	3045.3	O K
180 min Winter	0.942	0.942	14.8	3297.7	O K
240 min Winter	0.988	0.988	14.8	3480.8	O K
360 min Winter	1.052	1.052	14.8	3738.6	O K
480 min Winter	1.095	1.095	14.8	3915.5	O K
600 min Winter	1.126	1.126	14.8	4045.0	O K
720 min Winter	1.150	1.150	14.8	4142.9	O K
960 min Winter	1.181	1.181	14.8	4273.7	O K
1440 min Winter	1.210	1.210	14.9	4393.2	Flood Risk
2160 min Winter	1.211	1.211	14.9	4397.6	Flood Risk
2880 min Winter	1.189	1.189	14.8	4305.8	O K
4320 min Winter	1.099	1.099	14.8	3931.5	O K
5760 min Winter	1.013	1.013	14.8	3583.4	O K
7200 min Winter	0.928	0.928	14.8	3242.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	6547.5	6344
15 min Winter	187.006	0.0	1254.1	27
30 min Winter	108.845	0.0	1238.4	41
60 min Winter	63.353	0.0	2345.5	70
120 min Winter	36.874	0.0	2375.6	128
180 min Winter	26.867	0.0	2330.4	188
240 min Winter	21.462	0.0	2297.6	246
360 min Winter	15.638	0.0	2256.2	364
480 min Winter	12.492	0.0	2231.5	480
600 min Winter	10.494	0.0	2215.7	598
720 min Winter	9.102	0.0	2206.3	714
960 min Winter	7.267	0.0	2202.6	946
1440 min Winter	5.290	0.0	2199.3	1402
2160 min Winter	3.852	0.0	4472.0	2064
2880 min Winter	3.075	0.0	4343.2	2684
4320 min Winter	2.173	0.0	4051.0	3332
5760 min Winter	1.698	0.0	6824.3	4264
7200 min Winter	1.402	0.0	7022.6	5184

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.840	0.840	14.8	2899.6	O K
10080 min Winter	0.738	0.738	14.8	2513.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	7172.4	6064
10080 min Winter	1.051	0.0	7289.0	6864

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.040

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.680	4	8	1.680	8	12	1.680

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3071.6	1.500	4524.4

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0171-1480-1200-1480
Design Head (m)	1.200
Design Flow (l/s)	14.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	171
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	14.8	Kick-Flo®	0.805	12.3
Flush-Flo™	0.366	14.8	Mean Flow over Head Range	-	12.7

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	6.1	1.200	14.8	3.000	22.9	7.000	34.4
0.200	13.9	1.400	15.9	3.500	24.7	7.500	35.6
0.300	14.7	1.600	17.0	4.000	26.3	8.000	36.7
0.400	14.8	1.800	17.9	4.500	27.8	8.500	37.8
0.500	14.6	2.000	18.9	5.000	29.3	9.000	38.9
0.600	14.2	2.200	19.7	5.500	30.6	9.500	39.9
0.800	12.4	2.400	20.6	6.000	32.0		
1.000	13.6	2.600	21.4	6.500	33.2		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.090	0.090	5.3	326.1	O K
30 min Summer	0.111	0.111	7.6	404.9	O K
60 min Summer	0.136	0.136	10.5	497.9	O K
120 min Summer	0.163	0.163	13.4	600.9	O K
180 min Summer	0.179	0.179	14.8	660.9	O K
240 min Summer	0.190	0.190	15.7	699.8	O K
360 min Summer	0.202	0.202	16.2	747.5	O K
480 min Summer	0.212	0.212	16.3	783.2	O K
600 min Summer	0.219	0.219	16.4	810.5	O K
720 min Summer	0.224	0.224	16.5	831.8	O K
960 min Summer	0.232	0.232	16.5	860.6	O K
1440 min Summer	0.238	0.238	16.6	885.7	O K
2160 min Summer	0.238	0.238	16.6	883.0	O K
2880 min Summer	0.231	0.231	16.5	859.2	O K
4320 min Summer	0.207	0.207	16.2	766.6	O K
5760 min Summer	0.188	0.188	15.6	695.6	O K
7200 min Summer	0.175	0.175	14.4	643.3	O K
8640 min Summer	0.164	0.164	13.4	601.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	200.1	26
30 min Summer	18.857	0.0	269.4	41
60 min Summer	11.811	0.0	428.7	70
120 min Summer	7.397	0.0	553.4	126
180 min Summer	5.626	0.0	640.4	184
240 min Summer	4.633	0.0	709.3	242
360 min Summer	3.524	0.0	817.1	324
480 min Summer	2.902	0.0	901.7	388
600 min Summer	2.496	0.0	972.0	454
720 min Summer	2.207	0.0	1032.5	520
960 min Summer	1.817	0.0	1132.4	660
1440 min Summer	1.380	0.0	1280.0	936
2160 min Summer	1.049	0.0	1583.3	1344
2880 min Summer	0.863	0.0	1733.6	1736
4320 min Summer	0.637	0.0	1889.1	2476
5760 min Summer	0.513	0.0	2116.9	3224
7200 min Summer	0.434	0.0	2231.1	3960
8640 min Summer	0.378	0.0	2322.3	4672

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.154	0.154	12.5	567.0	O K
15 min Winter	0.100	0.100	6.5	365.0	O K
30 min Winter	0.124	0.124	9.1	453.1	O K
60 min Winter	0.152	0.152	12.2	557.4	O K
120 min Winter	0.183	0.183	15.1	674.0	O K
180 min Winter	0.201	0.201	16.1	743.0	O K
240 min Winter	0.214	0.214	16.3	791.0	O K
360 min Winter	0.230	0.230	16.5	851.9	O K
480 min Winter	0.239	0.239	16.6	886.7	O K
600 min Winter	0.245	0.245	16.7	912.4	O K
720 min Winter	0.251	0.251	16.7	932.7	O K
960 min Winter	0.257	0.257	16.8	955.6	O K
1440 min Winter	0.258	0.258	16.8	961.9	O K
2160 min Winter	0.249	0.249	16.7	926.3	O K
2880 min Winter	0.235	0.235	16.6	871.1	O K
4320 min Winter	0.198	0.198	16.1	731.8	O K
5760 min Winter	0.175	0.175	14.5	646.6	O K
7200 min Winter	0.159	0.159	13.0	585.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	2388.5	5352
15 min Winter	30.107	0.0	233.0	26
30 min Winter	18.857	0.0	311.9	40
60 min Winter	11.811	0.0	488.3	68
120 min Winter	7.397	0.0	628.5	124
180 min Winter	5.626	0.0	726.1	180
240 min Winter	4.633	0.0	803.2	238
360 min Winter	3.524	0.0	923.9	348
480 min Winter	2.902	0.0	1018.5	448
600 min Winter	2.496	0.0	1097.1	482
720 min Winter	2.207	0.0	1164.8	560
960 min Winter	1.817	0.0	1276.5	716
1440 min Winter	1.380	0.0	1441.0	1018
2160 min Winter	1.049	0.0	1779.8	1452
2880 min Winter	0.863	0.0	1949.3	1852
4320 min Winter	0.637	0.0	2127.3	2596
5760 min Winter	0.513	0.0	2375.5	3304
7200 min Winter	0.434	0.0	2504.5	4040

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.147	0.147	11.7	539.2	O K
10080 min Winter	0.137	0.137	10.7	503.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	2608.5	4760
10080 min Winter	0.337	0.0	2686.2	5464

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.840

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.947	4	8	1.947	8	12	1.947

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3598.2	1.500	5214.4

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0183-1720-1200-1720
Design Head (m)	1.200
Design Flow (l/s)	17.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	183
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	17.2	Kick-Flo®	0.818	14.3
Flush-Flo™	0.373	17.2	Mean Flow over Head Range	-	14.7

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	6.4	1.200	17.2	3.000	26.6	7.000	40.1
0.200	16.1	1.400	18.5	3.500	28.7	7.500	41.4
0.300	17.0	1.600	19.7	4.000	30.6	8.000	42.7
0.400	17.2	1.800	20.9	4.500	32.4	8.500	44.0
0.500	17.0	2.000	21.9	5.000	34.1	9.000	45.3
0.600	16.6	2.200	23.0	5.500	35.7	9.500	46.5
0.800	14.7	2.400	23.9	6.000	37.2		
1.000	15.8	2.600	24.9	6.500	38.7		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.261	0.261	16.8	972.1	O K
30 min Summer	0.306	0.306	17.1	1147.6	O K
60 min Summer	0.357	0.357	17.2	1347.9	O K
120 min Summer	0.413	0.413	17.2	1569.4	O K
180 min Summer	0.446	0.446	17.2	1704.3	O K
240 min Summer	0.469	0.469	17.2	1798.8	O K
360 min Summer	0.500	0.500	17.2	1924.4	O K
480 min Summer	0.519	0.519	17.2	2002.0	O K
600 min Summer	0.531	0.531	17.2	2051.2	O K
720 min Summer	0.538	0.538	17.2	2081.4	O K
960 min Summer	0.544	0.544	17.2	2104.4	O K
1440 min Summer	0.546	0.546	17.2	2113.9	O K
2160 min Summer	0.539	0.539	17.2	2084.3	O K
2880 min Summer	0.525	0.525	17.2	2025.2	O K
4320 min Summer	0.468	0.468	17.2	1794.2	O K
5760 min Summer	0.415	0.415	17.2	1580.2	O K
7200 min Summer	0.368	0.368	17.2	1391.0	O K
8640 min Summer	0.327	0.327	17.1	1228.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	771.4	26
30 min Summer	53.466	0.0	923.6	41
60 min Summer	31.728	0.0	1266.7	70
120 min Summer	18.829	0.0	1510.1	130
180 min Summer	13.876	0.0	1670.1	188
240 min Summer	11.174	0.0	1791.4	248
360 min Summer	8.234	0.0	1971.9	366
480 min Summer	6.631	0.0	2104.3	484
600 min Summer	5.605	0.0	2206.6	602
720 min Summer	4.887	0.0	2286.9	722
960 min Summer	3.933	0.0	2395.1	902
1440 min Summer	2.896	0.0	2435.9	1140
2160 min Summer	2.132	0.0	3252.6	1520
2880 min Summer	1.716	0.0	3474.7	1936
4320 min Summer	1.226	0.0	3666.9	2728
5760 min Summer	0.966	0.0	4017.9	3520
7200 min Summer	0.803	0.0	4166.5	4256
8640 min Summer	0.690	0.0	4282.8	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.291	0.291	17.0	1090.2	O K
15 min Winter	0.291	0.291	17.0	1090.0	O K
30 min Winter	0.342	0.342	17.2	1287.4	O K
60 min Winter	0.399	0.399	17.2	1513.5	O K
120 min Winter	0.461	0.461	17.2	1765.2	O K
180 min Winter	0.499	0.499	17.2	1919.7	O K
240 min Winter	0.526	0.526	17.2	2029.4	O K
360 min Winter	0.561	0.561	17.2	2177.7	O K
480 min Winter	0.584	0.584	17.2	2272.7	O K
600 min Winter	0.599	0.599	17.2	2336.4	O K
720 min Winter	0.609	0.609	17.2	2379.2	O K
960 min Winter	0.620	0.620	17.2	2422.2	O K
1440 min Winter	0.618	0.618	17.2	2416.3	O K
2160 min Winter	0.604	0.604	17.2	2355.6	O K
2880 min Winter	0.581	0.581	17.2	2257.9	O K
4320 min Winter	0.497	0.497	17.2	1913.6	O K
5760 min Winter	0.418	0.418	17.2	1592.7	O K
7200 min Winter	0.349	0.349	17.2	1316.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	4363.6	5664
15 min Winter	90.095	0.0	870.9	26
30 min Winter	53.466	0.0	1034.9	41
60 min Winter	31.728	0.0	1424.4	70
120 min Winter	18.829	0.0	1694.3	128
180 min Winter	13.876	0.0	1870.4	186
240 min Winter	11.174	0.0	2002.7	244
360 min Winter	8.234	0.0	2196.5	360
480 min Winter	6.631	0.0	2333.8	476
600 min Winter	5.605	0.0	2434.1	590
720 min Winter	4.887	0.0	2505.4	704
960 min Winter	3.933	0.0	2573.2	924
1440 min Winter	2.896	0.0	2496.1	1334
2160 min Winter	2.132	0.0	3640.1	1652
2880 min Winter	1.716	0.0	3883.9	2112
4320 min Winter	1.226	0.0	4083.6	2984
5760 min Winter	0.966	0.0	4504.1	3760
7200 min Winter	0.803	0.0	4672.6	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.291	0.291	17.0	1090.7	O K
10080 min Winter	0.246	0.246	16.7	914.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	4805.7	5192
10080 min Winter	0.608	0.0	4902.0	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.840

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.947	4	8	1.947	8	12	1.947

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3598.2	1.500	5214.4

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0183-1720-1200-1720
Design Head (m)	1.200
Design Flow (l/s)	17.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	183
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	17.2	Kick-Flo®	0.818	14.3
Flush-Flo™	0.373	17.2	Mean Flow over Head Range	-	14.7

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	6.4	1.200	17.2	3.000	26.6	7.000	40.1
0.200	16.1	1.400	18.5	3.500	28.7	7.500	41.4
0.300	17.0	1.600	19.7	4.000	30.6	8.000	42.7
0.400	17.2	1.800	20.9	4.500	32.4	8.500	44.0
0.500	17.0	2.000	21.9	5.000	34.1	9.000	45.3
0.600	16.6	2.200	23.0	5.500	35.7	9.500	46.5
0.800	14.7	2.400	23.9	6.000	37.2		
1.000	15.8	2.600	24.9	6.500	38.7		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.526	0.526	17.2	2029.9	O K
30 min Summer	0.604	0.604	17.2	2356.2	O K
60 min Summer	0.691	0.691	17.2	2727.0	O K
120 min Summer	0.786	0.786	17.2	3141.7	O K
180 min Summer	0.845	0.845	17.2	3401.6	O K
240 min Summer	0.886	0.886	17.2	3589.1	O K
360 min Summer	0.944	0.944	17.2	3850.4	O K
480 min Summer	0.982	0.982	17.2	4027.5	O K
600 min Summer	1.010	1.010	17.2	4155.0	O K
720 min Summer	1.030	1.030	17.2	4249.5	O K
960 min Summer	1.056	1.056	17.2	4371.0	O K
1440 min Summer	1.076	1.076	17.2	4464.7	O K
2160 min Summer	1.067	1.067	17.2	4424.9	O K
2880 min Summer	1.050	1.050	17.2	4342.6	O K
4320 min Summer	0.977	0.977	17.2	4001.8	O K
5760 min Summer	0.910	0.910	17.2	3695.1	O K
7200 min Summer	0.845	0.845	17.2	3402.0	O K
8640 min Summer	0.775	0.775	17.2	3094.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	1439.4	27
30 min Summer	108.845	0.0	1452.5	42
60 min Summer	63.353	0.0	2494.2	72
120 min Summer	36.874	0.0	2754.8	130
180 min Summer	26.867	0.0	2770.4	190
240 min Summer	21.462	0.0	2729.2	250
360 min Summer	15.638	0.0	2660.2	368
480 min Summer	12.492	0.0	2609.2	488
600 min Summer	10.494	0.0	2569.5	608
720 min Summer	9.102	0.0	2536.7	726
960 min Summer	7.267	0.0	2483.6	966
1440 min Summer	5.290	0.0	2410.9	1442
2160 min Summer	3.852	0.0	5120.3	2056
2880 min Summer	3.075	0.0	4932.5	2372
4320 min Summer	2.173	0.0	4495.9	3120
5760 min Summer	1.698	0.0	7058.5	3928
7200 min Summer	1.402	0.0	7271.8	4760
8640 min Summer	1.200	0.0	7444.2	5536

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.711	0.711	17.2	2812.0	O K
15 min Winter	0.585	0.585	17.2	2275.3	O K
30 min Winter	0.671	0.671	17.2	2642.2	O K
60 min Winter	0.768	0.768	17.2	3059.9	O K
120 min Winter	0.873	0.873	17.2	3529.0	O K
180 min Winter	0.938	0.938	17.2	3822.1	O K
240 min Winter	0.984	0.984	17.2	4034.7	O K
360 min Winter	1.048	1.048	17.2	4334.0	O K
480 min Winter	1.092	1.092	17.2	4539.8	O K
600 min Winter	1.123	1.123	17.2	4690.4	O K
720 min Winter	1.147	1.147	17.2	4804.4	O K
960 min Winter	1.179	1.179	17.2	4957.1	O K
1440 min Winter	1.208	1.208	17.3	5097.5	Flood Risk
2160 min Winter	1.209	1.209	17.3	5105.0	Flood Risk
2880 min Winter	1.188	1.188	17.2	5000.7	O K
4320 min Winter	1.098	1.098	17.2	4570.8	O K
5760 min Winter	1.013	1.013	17.2	4168.1	O K
7200 min Winter	0.927	0.927	17.2	3771.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	7572.0	6264
15 min Winter	187.006	0.0	1458.0	27
30 min Winter	108.845	0.0	1443.6	41
60 min Winter	63.353	0.0	2709.8	70
120 min Winter	36.874	0.0	2775.5	128
180 min Winter	26.867	0.0	2723.3	188
240 min Winter	21.462	0.0	2684.2	246
360 min Winter	15.638	0.0	2633.3	364
480 min Winter	12.492	0.0	2601.8	480
600 min Winter	10.494	0.0	2580.4	598
720 min Winter	9.102	0.0	2565.8	714
960 min Winter	7.267	0.0	2552.5	946
1440 min Winter	5.290	0.0	2543.7	1402
2160 min Winter	3.852	0.0	5196.9	2064
2880 min Winter	3.075	0.0	5042.1	2680
4320 min Winter	2.173	0.0	4690.2	3332
5760 min Winter	1.698	0.0	7897.3	4264
7200 min Winter	1.402	0.0	8125.0	5184

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.837	0.837	17.2	3368.3	O K
10080 min Winter	0.736	0.736	17.2	2920.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	8298.5	6064
10080 min Winter	1.051	0.0	8432.0	6856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.840

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.947	4	8	1.947	8	12	1.947

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3598.2	1.500	5214.4

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0183-1720-1200-1720
Design Head (m)	1.200
Design Flow (l/s)	17.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	183
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	17.2	Kick-Flo®	0.818	14.3
Flush-Flo™	0.373	17.2	Mean Flow over Head Range	-	14.7

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	6.4	1.200	17.2	3.000	26.6	7.000	40.1
0.200	16.1	1.400	18.5	3.500	28.7	7.500	41.4
0.300	17.0	1.600	19.7	4.000	30.6	8.000	42.7
0.400	17.2	1.800	20.9	4.500	32.4	8.500	44.0
0.500	17.0	2.000	21.9	5.000	34.1	9.000	45.3
0.600	16.6	2.200	23.0	5.500	35.7	9.500	46.5
0.800	14.7	2.400	23.9	6.000	37.2		
1.000	15.8	2.600	24.9	6.500	38.7		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.095	0.095	4.6	175.3	O K
30 min Summer	0.117	0.117	6.2	216.7	O K
60 min Summer	0.142	0.142	7.7	265.1	O K
120 min Summer	0.170	0.170	8.5	318.0	O K
180 min Summer	0.186	0.186	8.7	349.4	O K
240 min Summer	0.197	0.197	8.8	370.1	O K
360 min Summer	0.210	0.210	8.9	395.5	O K
480 min Summer	0.219	0.219	8.9	413.1	O K
600 min Summer	0.225	0.225	9.0	426.0	O K
720 min Summer	0.230	0.230	9.0	435.5	O K
960 min Summer	0.236	0.236	9.0	447.3	O K
1440 min Summer	0.239	0.239	9.0	453.8	O K
2160 min Summer	0.234	0.234	9.0	443.7	O K
2880 min Summer	0.224	0.224	9.0	424.2	O K
4320 min Summer	0.194	0.194	8.7	365.2	O K
5760 min Summer	0.170	0.170	8.5	318.2	O K
7200 min Summer	0.153	0.153	8.2	285.2	O K
8640 min Summer	0.141	0.141	7.6	262.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	131.3	26
30 min Summer	18.857	0.0	172.3	40
60 min Summer	11.811	0.0	251.4	68
120 min Summer	7.397	0.0	320.4	126
180 min Summer	5.626	0.0	368.4	184
240 min Summer	4.633	0.0	406.4	242
360 min Summer	3.524	0.0	465.9	322
480 min Summer	2.902	0.0	512.9	386
600 min Summer	2.496	0.0	552.1	452
720 min Summer	2.207	0.0	586.0	518
960 min Summer	1.817	0.0	642.5	658
1440 min Summer	1.380	0.0	727.6	934
2160 min Summer	1.049	0.0	873.4	1344
2880 min Summer	0.863	0.0	957.2	1736
4320 min Summer	0.637	0.0	1048.4	2476
5760 min Summer	0.513	0.0	1155.0	3184
7200 min Summer	0.434	0.0	1218.7	3896
8640 min Summer	0.378	0.0	1270.9	4592

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.132	0.132	7.1	244.5	O K
15 min Winter	0.106	0.106	5.4	196.1	O K
30 min Winter	0.131	0.131	7.0	242.7	O K
60 min Winter	0.159	0.159	8.4	297.3	O K
120 min Winter	0.191	0.191	8.7	358.9	O K
180 min Winter	0.210	0.210	8.9	395.7	O K
240 min Winter	0.223	0.223	8.9	420.6	O K
360 min Winter	0.238	0.238	9.0	451.1	O K
480 min Winter	0.246	0.246	9.1	467.6	O K
600 min Winter	0.252	0.252	9.1	479.4	O K
720 min Winter	0.257	0.257	9.1	488.2	O K
960 min Winter	0.261	0.261	9.1	496.3	O K
1440 min Winter	0.259	0.259	9.1	492.1	O K
2160 min Winter	0.244	0.244	9.1	463.4	O K
2880 min Winter	0.225	0.225	9.0	426.2	O K
4320 min Winter	0.181	0.181	8.6	339.1	O K
5760 min Winter	0.151	0.151	8.1	282.4	O K
7200 min Winter	0.135	0.135	7.3	250.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	1311.0	5344
15 min Winter	30.107	0.0	150.8	26
30 min Winter	18.857	0.0	197.1	40
60 min Winter	11.811	0.0	284.3	68
120 min Winter	7.397	0.0	361.6	124
180 min Winter	5.626	0.0	415.3	180
240 min Winter	4.633	0.0	457.8	238
360 min Winter	3.524	0.0	524.5	348
480 min Winter	2.902	0.0	577.1	446
600 min Winter	2.496	0.0	620.9	482
720 min Winter	2.207	0.0	658.9	558
960 min Winter	1.817	0.0	721.9	714
1440 min Winter	1.380	0.0	816.7	1018
2160 min Winter	1.049	0.0	980.2	1452
2880 min Winter	0.863	0.0	1074.4	1852
4320 min Winter	0.637	0.0	1178.3	2596
5760 min Winter	0.513	0.0	1295.1	3280
7200 min Winter	0.434	0.0	1366.8	3968

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.122	0.122	6.5	226.6	O K
10080 min Winter	0.113	0.113	5.9	209.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	1426.0	4680
10080 min Winter	0.337	0.0	1472.7	5360

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.160

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.053	4	8	1.053	8	12	1.053

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1809.9	1.500	3028.8

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0138-9300-1200-9300
Design Head (m)	1.200
Design Flow (l/s)	9.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	138
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	9.3	Kick-Flo®	0.773	7.6
Flush-Flo™	0.356	9.3	Mean Flow over Head Range	-	8.1

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	5.0	1.200	9.3	3.000	14.3	7.000	21.5
0.200	8.8	1.400	10.0	3.500	15.4	7.500	22.2
0.300	9.2	1.600	10.6	4.000	16.5	8.000	22.9
0.400	9.3	1.800	11.3	4.500	17.4	8.500	23.6
0.500	9.1	2.000	11.8	5.000	18.3	9.000	24.3
0.600	8.9	2.200	12.4	5.500	19.2	9.500	24.9
0.800	7.7	2.400	12.9	6.000	20.0		
1.000	8.5	2.600	13.4	6.500	20.8		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.275	0.275	9.2	525.3	O K
30 min Summer	0.322	0.322	9.3	620.0	O K
60 min Summer	0.374	0.374	9.3	728.0	O K
120 min Summer	0.430	0.430	9.3	846.6	O K
180 min Summer	0.464	0.464	9.3	918.3	O K
240 min Summer	0.487	0.487	9.3	968.2	O K
360 min Summer	0.517	0.517	9.3	1033.8	O K
480 min Summer	0.535	0.535	9.3	1073.5	O K
600 min Summer	0.546	0.546	9.3	1097.9	O K
720 min Summer	0.553	0.553	9.3	1112.2	O K
960 min Summer	0.556	0.556	9.3	1120.4	O K
1440 min Summer	0.555	0.555	9.3	1117.0	O K
2160 min Summer	0.543	0.543	9.3	1090.9	O K
2880 min Summer	0.525	0.525	9.3	1051.7	O K
4320 min Summer	0.464	0.464	9.3	918.1	O K
5760 min Summer	0.408	0.408	9.3	798.0	O K
7200 min Summer	0.357	0.357	9.3	693.2	O K
8640 min Summer	0.314	0.314	9.3	603.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	455.0	26
30 min Summer	53.466	0.0	539.6	41
60 min Summer	31.728	0.0	711.5	70
120 min Summer	18.829	0.0	845.9	130
180 min Summer	13.876	0.0	934.5	188
240 min Summer	11.174	0.0	1002.0	248
360 min Summer	8.234	0.0	1103.0	366
480 min Summer	6.631	0.0	1177.5	484
600 min Summer	5.605	0.0	1235.3	602
720 min Summer	4.887	0.0	1280.7	722
960 min Summer	3.933	0.0	1340.2	916
1440 min Summer	2.896	0.0	1346.3	1142
2160 min Summer	2.132	0.0	1784.6	1524
2880 min Summer	1.716	0.0	1909.5	1936
4320 min Summer	1.226	0.0	2025.4	2732
5760 min Summer	0.966	0.0	2184.8	3520
7200 min Summer	0.803	0.0	2267.3	4256
8640 min Summer	0.690	0.0	2333.7	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.276	0.276	9.2	527.8	O K
15 min Winter	0.307	0.307	9.2	589.1	O K
30 min Winter	0.359	0.359	9.3	695.7	O K
60 min Winter	0.417	0.417	9.3	817.5	O K
120 min Winter	0.480	0.480	9.3	952.6	O K
180 min Winter	0.518	0.518	9.3	1035.2	O K
240 min Winter	0.544	0.544	9.3	1093.4	O K
360 min Winter	0.579	0.579	9.3	1171.8	O K
480 min Winter	0.601	0.601	9.3	1221.4	O K
600 min Winter	0.616	0.616	9.3	1254.1	O K
720 min Winter	0.625	0.625	9.3	1275.7	O K
960 min Winter	0.634	0.634	9.3	1295.9	O K
1440 min Winter	0.630	0.630	9.3	1286.6	O K
2160 min Winter	0.611	0.611	9.3	1242.2	O K
2880 min Winter	0.584	0.584	9.3	1181.5	O K
4320 min Winter	0.494	0.494	9.3	983.8	O K
5760 min Winter	0.410	0.410	9.3	803.8	O K
7200 min Winter	0.337	0.337	9.3	651.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	2383.6	5664
15 min Winter	90.095	0.0	510.3	26
30 min Winter	53.466	0.0	600.8	41
60 min Winter	31.728	0.0	798.3	70
120 min Winter	18.829	0.0	947.5	128
180 min Winter	13.876	0.0	1045.3	186
240 min Winter	11.174	0.0	1119.1	244
360 min Winter	8.234	0.0	1227.4	360
480 min Winter	6.631	0.0	1304.1	476
600 min Winter	5.605	0.0	1358.9	590
720 min Winter	4.887	0.0	1395.5	704
960 min Winter	3.933	0.0	1418.0	926
1440 min Winter	2.896	0.0	1365.8	1342
2160 min Winter	2.132	0.0	1997.0	1664
2880 min Winter	1.716	0.0	2134.8	2112
4320 min Winter	1.226	0.0	2257.2	2984
5760 min Winter	0.966	0.0	2448.2	3760
7200 min Winter	0.803	0.0	2541.4	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.276	0.276	9.2	527.4	O K
10080 min Winter	0.228	0.228	9.0	431.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	2616.8	5192
10080 min Winter	0.608	0.0	2675.2	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.160

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.053	4	8	1.053	8	12	1.053

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1809.9	1.500	3028.8

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0138-9300-1200-9300
Design Head (m)	1.200
Design Flow (l/s)	9.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	138
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	9.3	Kick-Flo®	0.773	7.6
Flush-Flo™	0.356	9.3	Mean Flow over Head Range	-	8.1

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	5.0	1.200	9.3	3.000	14.3	7.000	21.5
0.200	8.8	1.400	10.0	3.500	15.4	7.500	22.2
0.300	9.2	1.600	10.6	4.000	16.5	8.000	22.9
0.400	9.3	1.800	11.3	4.500	17.4	8.500	23.6
0.500	9.1	2.000	11.8	5.000	18.3	9.000	24.3
0.600	8.9	2.200	12.4	5.500	19.2	9.500	24.9
0.800	7.7	2.400	12.9	6.000	20.0		
1.000	8.5	2.600	13.4	6.500	20.8		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.546	0.546	9.3	1098.0	O K
30 min Summer	0.625	0.625	9.3	1274.5	O K
60 min Summer	0.711	0.711	9.3	1474.8	O K
120 min Summer	0.805	0.805	9.3	1698.8	O K
180 min Summer	0.862	0.862	9.3	1837.7	O K
240 min Summer	0.902	0.902	9.3	1937.4	O K
360 min Summer	0.957	0.957	9.3	2075.9	O K
480 min Summer	0.993	0.993	9.3	2169.1	O K
600 min Summer	1.019	1.019	9.3	2235.7	O K
720 min Summer	1.037	1.037	9.3	2284.6	O K
960 min Summer	1.061	1.061	9.3	2346.1	O K
1440 min Summer	1.077	1.077	9.3	2389.3	O K
2160 min Summer	1.065	1.065	9.3	2358.3	O K
2880 min Summer	1.046	1.046	9.3	2306.2	O K
4320 min Summer	0.971	0.971	9.3	2112.9	O K
5760 min Summer	0.905	0.905	9.3	1945.2	O K
7200 min Summer	0.842	0.842	9.3	1790.0	O K
8640 min Summer	0.779	0.779	9.3	1636.5	O K
10080 min Summer	0.710	0.710	9.3	1472.9	O K
15 min Winter	0.605	0.605	9.3	1230.8	O K
30 min Winter	0.692	0.692	9.3	1429.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	784.1	27
30 min Summer	108.845	0.0	781.4	42
60 min Summer	63.353	0.0	1387.0	72
120 min Summer	36.874	0.0	1490.5	130
180 min Summer	26.867	0.0	1471.2	190
240 min Summer	21.462	0.0	1449.4	250
360 min Summer	15.638	0.0	1416.2	368
480 min Summer	12.492	0.0	1393.3	488
600 min Summer	10.494	0.0	1376.5	608
720 min Summer	9.102	0.0	1363.4	726
960 min Summer	7.267	0.0	1345.0	966
1440 min Summer	5.290	0.0	1331.2	1442
2160 min Summer	3.852	0.0	2779.4	2056
2880 min Summer	3.075	0.0	2685.1	2376
4320 min Summer	2.173	0.0	2462.5	3120
5760 min Summer	1.698	0.0	3837.9	3928
7200 min Summer	1.402	0.0	3956.7	4760
8640 min Summer	1.200	0.0	4053.0	5624
10080 min Summer	1.051	0.0	4130.8	6352
15 min Winter	187.006	0.0	785.9	27
30 min Winter	108.845	0.0	769.7	41

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.787	0.787	9.3	1655.4	O K
120 min Winter	0.890	0.890	9.3	1907.7	O K
180 min Winter	0.952	0.952	9.3	2064.9	O K
240 min Winter	0.997	0.997	9.3	2178.8	O K
360 min Winter	1.058	1.058	9.3	2338.7	O K
480 min Winter	1.099	1.099	9.3	2448.0	O K
600 min Winter	1.129	1.129	9.3	2527.6	O K
720 min Winter	1.151	1.151	9.3	2587.5	O K
960 min Winter	1.180	1.180	9.3	2666.8	O K
1440 min Winter	1.205	1.205	9.3	2736.6	Flood Risk
2160 min Winter	1.204	1.204	9.3	2732.6	Flood Risk
2880 min Winter	1.181	1.181	9.3	2669.5	O K
4320 min Winter	1.091	1.091	9.3	2426.7	O K
5760 min Winter	1.007	1.007	9.3	2204.9	O K
7200 min Winter	0.923	0.923	9.3	1991.0	O K
8640 min Winter	0.838	0.838	9.3	1779.6	O K
10080 min Winter	0.740	0.740	9.3	1542.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	63.353	0.0	1484.3	70
120 min Winter	36.874	0.0	1472.5	128
180 min Winter	26.867	0.0	1445.1	188
240 min Winter	21.462	0.0	1426.5	246
360 min Winter	15.638	0.0	1404.6	364
480 min Winter	12.492	0.0	1393.4	480
600 min Winter	10.494	0.0	1388.5	598
720 min Winter	9.102	0.0	1388.5	714
960 min Winter	7.267	0.0	1398.4	946
1440 min Winter	5.290	0.0	1399.2	1402
2160 min Winter	3.852	0.0	2813.5	2064
2880 min Winter	3.075	0.0	2739.6	2684
4320 min Winter	2.173	0.0	2574.4	3332
5760 min Winter	1.698	0.0	4295.4	4264
7200 min Winter	1.402	0.0	4424.5	5184
8640 min Winter	1.200	0.0	4523.3	6064
10080 min Winter	1.051	0.0	4600.4	6952

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.160

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.053	4	8	1.053	8	12	1.053

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1809.9	1.500	3028.8

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0138-9300-1200-9300
Design Head (m)	1.200
Design Flow (l/s)	9.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	138
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)	1.200	9.3
Flush-Flo™	0.356	9.3
Kick-Flo®	0.773	7.6
Mean Flow over Head Range	-	8.1

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	5.0	1.200	9.3	3.000	14.3	7.000	21.5
0.200	8.8	1.400	10.0	3.500	15.4	7.500	22.2
0.300	9.2	1.600	10.6	4.000	16.5	8.000	22.9
0.400	9.3	1.800	11.3	4.500	17.4	8.500	23.6
0.500	9.1	2.000	11.8	5.000	18.3	9.000	24.3
0.600	8.9	2.200	12.4	5.500	19.2	9.500	24.9
0.800	7.7	2.400	12.9	6.000	20.0		
1.000	8.5	2.600	13.4	6.500	20.8		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.095	0.095	4.6	177.5	O K
30 min Summer	0.117	0.117	6.2	219.5	O K
60 min Summer	0.142	0.142	7.7	268.5	O K
120 min Summer	0.170	0.170	8.6	322.2	O K
180 min Summer	0.186	0.186	8.7	354.1	O K
240 min Summer	0.197	0.197	8.8	375.2	O K
360 min Summer	0.210	0.210	8.9	401.1	O K
480 min Summer	0.219	0.219	9.0	418.9	O K
600 min Summer	0.225	0.225	9.0	432.1	O K
720 min Summer	0.230	0.230	9.0	441.8	O K
960 min Summer	0.236	0.236	9.1	453.9	O K
1440 min Summer	0.240	0.240	9.1	460.8	O K
2160 min Summer	0.235	0.235	9.1	450.9	O K
2880 min Summer	0.225	0.225	9.0	431.5	O K
4320 min Summer	0.195	0.195	8.8	371.8	O K
5760 min Summer	0.171	0.171	8.6	324.1	O K
7200 min Summer	0.154	0.154	8.3	290.3	O K
8640 min Summer	0.142	0.142	7.7	267.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	132.5	26
30 min Summer	18.857	0.0	174.0	40
60 min Summer	11.811	0.0	254.3	68
120 min Summer	7.397	0.0	324.1	126
180 min Summer	5.626	0.0	372.7	184
240 min Summer	4.633	0.0	411.1	242
360 min Summer	3.524	0.0	471.4	324
480 min Summer	2.902	0.0	518.9	388
600 min Summer	2.496	0.0	558.6	452
720 min Summer	2.207	0.0	592.9	520
960 min Summer	1.817	0.0	650.0	658
1440 min Summer	1.380	0.0	736.0	936
2160 min Summer	1.049	0.0	884.2	1344
2880 min Summer	0.863	0.0	969.0	1736
4320 min Summer	0.637	0.0	1061.2	2504
5760 min Summer	0.513	0.0	1169.5	3184
7200 min Summer	0.434	0.0	1233.9	3896
8640 min Summer	0.378	0.0	1286.7	4592

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.132	0.132	7.2	249.0	O K
15 min Winter	0.106	0.106	5.5	198.7	O K
30 min Winter	0.131	0.131	7.1	245.9	O K
60 min Winter	0.159	0.159	8.4	301.2	O K
120 min Winter	0.191	0.191	8.8	363.7	O K
180 min Winter	0.210	0.210	8.9	401.1	O K
240 min Winter	0.223	0.223	9.0	426.4	O K
360 min Winter	0.238	0.238	9.1	457.6	O K
480 min Winter	0.246	0.246	9.1	474.4	O K
600 min Winter	0.252	0.252	9.2	486.4	O K
720 min Winter	0.257	0.257	9.2	495.4	O K
960 min Winter	0.261	0.261	9.2	503.8	O K
1440 min Winter	0.259	0.259	9.2	500.0	O K
2160 min Winter	0.245	0.245	9.1	471.4	O K
2880 min Winter	0.226	0.226	9.0	434.0	O K
4320 min Winter	0.182	0.182	8.7	345.8	O K
5760 min Winter	0.152	0.152	8.2	287.6	O K
7200 min Winter	0.135	0.135	7.3	254.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	1327.3	5344
15 min Winter	30.107	0.0	152.3	26
30 min Winter	18.857	0.0	199.0	40
60 min Winter	11.811	0.0	287.6	68
120 min Winter	7.397	0.0	365.8	124
180 min Winter	5.626	0.0	420.2	180
240 min Winter	4.633	0.0	463.2	238
360 min Winter	3.524	0.0	530.7	348
480 min Winter	2.902	0.0	583.9	448
600 min Winter	2.496	0.0	628.2	482
720 min Winter	2.207	0.0	666.6	560
960 min Winter	1.817	0.0	730.4	716
1440 min Winter	1.380	0.0	826.2	1018
2160 min Winter	1.049	0.0	992.3	1452
2880 min Winter	0.863	0.0	1087.7	1852
4320 min Winter	0.637	0.0	1192.8	2600
5760 min Winter	0.513	0.0	1311.3	3280
7200 min Winter	0.434	0.0	1383.9	3968

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.123	0.123	6.6	230.9	O K
10080 min Winter	0.114	0.114	6.0	213.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	1443.8	4680
10080 min Winter	0.337	0.0	1491.0	5440

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.200

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.067	4	8	1.067	8	12	1.067

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1834.6	1.500	3070.1

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0139-9400-1200-9400
Design Head (m)	1.200
Design Flow (l/s)	9.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	139
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	9.4	Kick-Flo®	0.769	7.6
Flush-Flo™	0.355	9.3	Mean Flow over Head Range	-	8.1

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	5.0	1.200	9.4	3.000	14.5	7.000	21.7
0.200	8.8	1.400	10.1	3.500	15.6	7.500	22.5
0.300	9.3	1.600	10.8	4.000	16.6	8.000	23.2
0.400	9.3	1.800	11.4	4.500	17.6	8.500	23.9
0.500	9.2	2.000	12.0	5.000	18.5	9.000	24.5
0.600	8.9	2.200	12.5	5.500	19.4	9.500	25.2
0.800	7.8	2.400	13.0	6.000	20.2		
1.000	8.6	2.600	13.5	6.500	21.0		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.275	0.275	9.2	532.0	O K
30 min Summer	0.322	0.322	9.3	628.0	O K
60 min Summer	0.374	0.374	9.3	737.3	O K
120 min Summer	0.430	0.430	9.3	857.7	O K
180 min Summer	0.464	0.464	9.3	930.4	O K
240 min Summer	0.487	0.487	9.3	981.1	O K
360 min Summer	0.517	0.517	9.3	1047.8	O K
480 min Summer	0.535	0.535	9.3	1088.4	O K
600 min Summer	0.546	0.546	9.3	1113.5	O K
720 min Summer	0.553	0.553	9.3	1128.2	O K
960 min Summer	0.557	0.557	9.3	1137.0	O K
1440 min Summer	0.555	0.555	9.3	1133.9	O K
2160 min Summer	0.544	0.544	9.3	1107.9	O K
2880 min Summer	0.526	0.526	9.3	1068.8	O K
4320 min Summer	0.465	0.465	9.3	934.1	O K
5760 min Summer	0.409	0.409	9.3	812.8	O K
7200 min Summer	0.359	0.359	9.3	706.7	O K
8640 min Summer	0.316	0.316	9.3	615.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	459.9	26
30 min Summer	53.466	0.0	545.3	41
60 min Summer	31.728	0.0	719.9	70
120 min Summer	18.829	0.0	855.9	130
180 min Summer	13.876	0.0	945.6	188
240 min Summer	11.174	0.0	1013.8	248
360 min Summer	8.234	0.0	1115.7	366
480 min Summer	6.631	0.0	1190.9	484
600 min Summer	5.605	0.0	1249.0	602
720 min Summer	4.887	0.0	1294.4	722
960 min Summer	3.933	0.0	1353.1	918
1440 min Summer	2.896	0.0	1354.8	1144
2160 min Summer	2.132	0.0	1806.5	1532
2880 min Summer	1.716	0.0	1932.8	1940
4320 min Summer	1.226	0.0	2049.4	2732
5760 min Summer	0.966	0.0	2212.3	3520
7200 min Summer	0.803	0.0	2295.8	4256
8640 min Summer	0.690	0.0	2363.0	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.278	0.278	9.2	538.7	O K
15 min Winter	0.306	0.306	9.3	596.6	O K
30 min Winter	0.358	0.358	9.3	704.6	O K
60 min Winter	0.416	0.416	9.3	828.1	O K
120 min Winter	0.480	0.480	9.3	965.0	O K
180 min Winter	0.517	0.517	9.3	1048.8	O K
240 min Winter	0.544	0.544	9.3	1107.9	O K
360 min Winter	0.579	0.579	9.3	1187.6	O K
480 min Winter	0.601	0.601	9.3	1238.1	O K
600 min Winter	0.616	0.616	9.3	1271.6	O K
720 min Winter	0.626	0.626	9.3	1293.8	O K
960 min Winter	0.635	0.635	9.3	1314.9	O K
1440 min Winter	0.631	0.631	9.3	1306.6	O K
2160 min Winter	0.612	0.612	9.3	1262.1	O K
2880 min Winter	0.585	0.585	9.3	1201.3	O K
4320 min Winter	0.497	0.497	9.3	1002.3	O K
5760 min Winter	0.413	0.413	9.3	820.4	O K
7200 min Winter	0.340	0.340	9.3	665.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	2413.4	5664
15 min Winter	90.095	0.0	515.7	26
30 min Winter	53.466	0.0	607.0	41
60 min Winter	31.728	0.0	807.8	70
120 min Winter	18.829	0.0	958.7	128
180 min Winter	13.876	0.0	1057.5	186
240 min Winter	11.174	0.0	1132.0	244
360 min Winter	8.234	0.0	1241.2	360
480 min Winter	6.631	0.0	1318.2	476
600 min Winter	5.605	0.0	1372.7	590
720 min Winter	4.887	0.0	1408.5	704
960 min Winter	3.933	0.0	1427.9	928
1440 min Winter	2.896	0.0	1373.4	1344
2160 min Winter	2.132	0.0	2021.4	1668
2880 min Winter	1.716	0.0	2160.5	2116
4320 min Winter	1.226	0.0	2283.0	2984
5760 min Winter	0.966	0.0	2479.0	3800
7200 min Winter	0.803	0.0	2573.3	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.279	0.279	9.2	539.7	O K
10080 min Winter	0.230	0.230	9.0	441.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	2649.7	5200
10080 min Winter	0.608	0.0	2708.7	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.200

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.067	4	8	1.067	8	12	1.067

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1834.6	1.500	3070.1

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0139-9400-1200-9400
Design Head (m)	1.200
Design Flow (l/s)	9.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	139
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	9.4	Kick-Flo®	0.769	7.6
Flush-Flo™	0.355	9.3	Mean Flow over Head Range	-	8.1

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	5.0	1.200	9.4	3.000	14.5	7.000	21.7
0.200	8.8	1.400	10.1	3.500	15.6	7.500	22.5
0.300	9.3	1.600	10.8	4.000	16.6	8.000	23.2
0.400	9.3	1.800	11.4	4.500	17.6	8.500	23.9
0.500	9.2	2.000	12.0	5.000	18.5	9.000	24.5
0.600	8.9	2.200	12.5	5.500	19.4	9.500	25.2
0.800	7.8	2.400	13.0	6.000	20.2		
1.000	8.6	2.600	13.5	6.500	21.0		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.546	0.546	9.3	1112.0	O K
30 min Summer	0.624	0.624	9.3	1290.7	O K
60 min Summer	0.711	0.711	9.3	1493.7	O K
120 min Summer	0.805	0.805	9.3	1720.7	O K
180 min Summer	0.861	0.861	9.3	1861.3	O K
240 min Summer	0.901	0.901	9.3	1962.4	O K
360 min Summer	0.956	0.956	9.3	2102.9	O K
480 min Summer	0.993	0.993	9.3	2197.5	O K
600 min Summer	1.018	1.018	9.3	2265.1	O K
720 min Summer	1.037	1.037	9.3	2314.9	O K
960 min Summer	1.061	1.061	9.3	2377.6	O K
1440 min Summer	1.077	1.077	9.3	2422.1	O K
2160 min Summer	1.066	1.066	9.3	2391.7	O K
2880 min Summer	1.046	1.046	9.3	2339.4	O K
4320 min Summer	0.972	0.972	9.3	2144.6	O K
5760 min Summer	0.907	0.907	9.3	1975.7	O K
7200 min Summer	0.845	0.845	9.3	1819.6	O K
8640 min Summer	0.783	0.783	9.3	1666.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	789.1	27
30 min Summer	108.845	0.0	785.9	42
60 min Summer	63.353	0.0	1401.6	72
120 min Summer	36.874	0.0	1500.6	130
180 min Summer	26.867	0.0	1480.1	190
240 min Summer	21.462	0.0	1458.4	250
360 min Summer	15.638	0.0	1425.7	368
480 min Summer	12.492	0.0	1403.3	488
600 min Summer	10.494	0.0	1386.8	608
720 min Summer	9.102	0.0	1374.1	726
960 min Summer	7.267	0.0	1356.6	966
1440 min Summer	5.290	0.0	1344.1	1442
2160 min Summer	3.852	0.0	2800.4	2056
2880 min Summer	3.075	0.0	2706.1	2388
4320 min Summer	2.173	0.0	2483.4	3120
5760 min Summer	1.698	0.0	3886.0	3928
7200 min Summer	1.402	0.0	4005.9	4760
8640 min Summer	1.200	0.0	4102.7	5624

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.714	0.714	9.3	1502.3	O K
15 min Winter	0.605	0.605	9.3	1246.5	O K
30 min Winter	0.691	0.691	9.3	1447.5	O K
60 min Winter	0.787	0.787	9.3	1676.5	O K
120 min Winter	0.889	0.889	9.3	1932.1	O K
180 min Winter	0.952	0.952	9.3	2091.5	O K
240 min Winter	0.996	0.996	9.3	2206.9	O K
360 min Winter	1.057	1.057	9.3	2369.0	O K
480 min Winter	1.099	1.099	9.3	2479.9	O K
600 min Winter	1.128	1.128	9.3	2560.8	O K
720 min Winter	1.150	1.150	9.3	2621.7	O K
960 min Winter	1.180	1.180	9.3	2702.3	O K
1440 min Winter	1.205	1.205	9.4	2773.9	Flood Risk
2160 min Winter	1.204	1.204	9.4	2771.0	Flood Risk
2880 min Winter	1.182	1.182	9.3	2708.1	O K
4320 min Winter	1.092	1.092	9.3	2463.3	O K
5760 min Winter	1.009	1.009	9.3	2240.0	O K
7200 min Winter	0.926	0.926	9.3	2024.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	4180.7	6352
15 min Winter	187.006	0.0	790.5	27
30 min Winter	108.845	0.0	773.9	41
60 min Winter	63.353	0.0	1496.4	70
120 min Winter	36.874	0.0	1481.5	128
180 min Winter	26.867	0.0	1454.5	188
240 min Winter	21.462	0.0	1436.4	246
360 min Winter	15.638	0.0	1415.3	364
480 min Winter	12.492	0.0	1404.8	480
600 min Winter	10.494	0.0	1400.7	598
720 min Winter	9.102	0.0	1401.5	714
960 min Winter	7.267	0.0	1412.3	946
1440 min Winter	5.290	0.0	1412.7	1402
2160 min Winter	3.852	0.0	2836.3	2064
2880 min Winter	3.075	0.0	2763.1	2684
4320 min Winter	2.173	0.0	2599.0	3332
5760 min Winter	1.698	0.0	4349.0	4264
7200 min Winter	1.402	0.0	4479.2	5184

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.842	0.842	9.3	1813.0	O K
10080 min Winter	0.746	0.746	9.3	1578.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	4577.6	6064
10080 min Winter	1.051	0.0	4651.3	6960

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.200

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.067	4	8	1.067	8	12	1.067

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1834.6	1.500	3070.1

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0139-9400-1200-9400
Design Head (m)	1.200
Design Flow (l/s)	9.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	139
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	9.4	Kick-Flo®	0.769	7.6
Flush-Flo™	0.355	9.3	Mean Flow over Head Range	-	8.1

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	5.0	1.200	9.4	3.000	14.5	7.000	21.7
0.200	8.8	1.400	10.1	3.500	15.6	7.500	22.5
0.300	9.3	1.600	10.8	4.000	16.6	8.000	23.2
0.400	9.3	1.800	11.4	4.500	17.6	8.500	23.9
0.500	9.2	2.000	12.0	5.000	18.5	9.000	24.5
0.600	8.9	2.200	12.5	5.500	19.4	9.500	25.2
0.800	7.8	2.400	13.0	6.000	20.2		
1.000	8.6	2.600	13.5	6.500	21.0		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.088	0.088	5.0	305.9	O K
30 min Summer	0.109	0.109	7.2	379.9	O K
60 min Summer	0.134	0.134	9.9	467.1	O K
120 min Summer	0.161	0.161	12.6	563.7	O K
180 min Summer	0.176	0.176	13.9	619.8	O K
240 min Summer	0.187	0.187	14.7	656.2	O K
360 min Summer	0.199	0.199	15.1	701.4	O K
480 min Summer	0.208	0.208	15.2	734.9	O K
600 min Summer	0.216	0.216	15.3	760.5	O K
720 min Summer	0.221	0.221	15.4	780.4	O K
960 min Summer	0.228	0.228	15.5	807.3	O K
1440 min Summer	0.235	0.235	15.6	830.8	O K
2160 min Summer	0.234	0.234	15.5	828.1	O K
2880 min Summer	0.228	0.228	15.5	805.6	O K
4320 min Summer	0.204	0.204	15.2	718.4	O K
5760 min Summer	0.185	0.185	14.6	650.9	O K
7200 min Summer	0.171	0.171	13.5	601.7	O K
8640 min Summer	0.160	0.160	12.6	562.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	188.6	26
30 min Summer	18.857	0.0	253.7	41
60 min Summer	11.811	0.0	402.9	70
120 min Summer	7.397	0.0	520.0	126
180 min Summer	5.626	0.0	601.7	184
240 min Summer	4.633	0.0	666.4	242
360 min Summer	3.524	0.0	767.6	326
480 min Summer	2.902	0.0	847.0	388
600 min Summer	2.496	0.0	913.0	454
720 min Summer	2.207	0.0	969.8	520
960 min Summer	1.817	0.0	1063.7	660
1440 min Summer	1.380	0.0	1202.2	936
2160 min Summer	1.049	0.0	1486.3	1344
2880 min Summer	0.863	0.0	1627.4	1736
4320 min Summer	0.637	0.0	1773.6	2476
5760 min Summer	0.513	0.0	1986.7	3224
7200 min Summer	0.434	0.0	2093.9	3960
8640 min Summer	0.378	0.0	2179.7	4672

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.151	0.151	11.7	529.9	O K
15 min Winter	0.098	0.098	6.1	342.4	O K
30 min Winter	0.122	0.122	8.6	425.1	O K
60 min Winter	0.149	0.149	11.6	522.9	O K
120 min Winter	0.180	0.180	14.2	632.2	O K
180 min Winter	0.198	0.198	15.1	697.1	O K
240 min Winter	0.210	0.210	15.3	742.2	O K
360 min Winter	0.226	0.226	15.5	799.4	O K
480 min Winter	0.235	0.235	15.6	832.1	O K
600 min Winter	0.242	0.242	15.6	856.1	O K
720 min Winter	0.247	0.247	15.7	875.1	O K
960 min Winter	0.253	0.253	15.7	896.5	O K
1440 min Winter	0.255	0.255	15.7	902.4	O K
2160 min Winter	0.245	0.245	15.6	869.0	O K
2880 min Winter	0.231	0.231	15.5	817.0	O K
4320 min Winter	0.195	0.195	15.1	685.6	O K
5760 min Winter	0.172	0.172	13.6	604.6	O K
7200 min Winter	0.156	0.156	12.2	546.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	2241.9	5352
15 min Winter	30.107	0.0	219.4	26
30 min Winter	18.857	0.0	293.6	40
60 min Winter	11.811	0.0	458.9	68
120 min Winter	7.397	0.0	590.5	124
180 min Winter	5.626	0.0	682.2	180
240 min Winter	4.633	0.0	754.6	238
360 min Winter	3.524	0.0	867.8	348
480 min Winter	2.902	0.0	956.6	448
600 min Winter	2.496	0.0	1030.4	484
720 min Winter	2.207	0.0	1094.0	560
960 min Winter	1.817	0.0	1198.8	716
1440 min Winter	1.380	0.0	1353.3	1018
2160 min Winter	1.049	0.0	1670.6	1452
2880 min Winter	0.863	0.0	1829.9	1852
4320 min Winter	0.637	0.0	1997.2	2596
5760 min Winter	0.513	0.0	2229.4	3304
7200 min Winter	0.434	0.0	2350.5	4040

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.144	0.144	11.0	503.6	O K
10080 min Winter	0.135	0.135	10.1	470.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	2448.3	4760
10080 min Winter	0.337	0.0	2521.3	5456

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.480

Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)
0	4	1.827	4	8	1.827	8	12	1.827

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3444.0	1.500	4708.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0178-1610-1200-1610
Design Head (m)	1.200
Design Flow (l/s)	16.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	178
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	16.1	Kick-Flo®	0.814	13.4
Flush-Flo™	0.370	16.1	Mean Flow over Head Range	-	13.8

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	6.3	1.200	16.1	3.000	24.9	7.000	37.5
0.200	15.1	1.400	17.3	3.500	26.8	7.500	38.7
0.300	16.0	1.600	18.5	4.000	28.6	8.000	40.0
0.400	16.1	1.800	19.5	4.500	30.3	8.500	41.2
0.500	15.9	2.000	20.5	5.000	31.8	9.000	42.3
0.600	15.5	2.200	21.5	5.500	33.3	9.500	43.4
0.800	13.7	2.400	22.4	6.000	34.8		
1.000	14.8	2.600	23.3	6.500	36.1		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.257	0.257	15.7	912.2	O K
30 min Summer	0.302	0.302	16.0	1076.8	O K
60 min Summer	0.353	0.353	16.1	1264.8	O K
120 min Summer	0.409	0.409	16.1	1472.7	O K
180 min Summer	0.442	0.442	16.1	1599.2	O K
240 min Summer	0.465	0.465	16.1	1687.9	O K
360 min Summer	0.496	0.496	16.1	1805.7	O K
480 min Summer	0.515	0.515	16.1	1878.6	O K
600 min Summer	0.527	0.527	16.1	1924.8	O K
720 min Summer	0.534	0.534	16.1	1953.2	O K
960 min Summer	0.540	0.540	16.1	1974.7	O K
1440 min Summer	0.542	0.542	16.1	1983.4	O K
2160 min Summer	0.535	0.535	16.1	1955.4	O K
2880 min Summer	0.521	0.521	16.1	1900.0	O K
4320 min Summer	0.464	0.464	16.1	1683.1	O K
5760 min Summer	0.411	0.411	16.1	1482.4	O K
7200 min Summer	0.364	0.364	16.1	1305.0	O K
8640 min Summer	0.323	0.323	16.0	1152.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	725.1	26
30 min Summer	53.466	0.0	868.0	41
60 min Summer	31.728	0.0	1189.5	70
120 min Summer	18.829	0.0	1418.0	130
180 min Summer	13.876	0.0	1568.2	188
240 min Summer	11.174	0.0	1682.0	248
360 min Summer	8.234	0.0	1851.4	366
480 min Summer	6.631	0.0	1975.6	484
600 min Summer	5.605	0.0	2071.5	602
720 min Summer	4.887	0.0	2146.8	722
960 min Summer	3.933	0.0	2247.9	904
1440 min Summer	2.896	0.0	2284.1	1140
2160 min Summer	2.132	0.0	3052.9	1520
2880 min Summer	1.716	0.0	3261.4	1936
4320 min Summer	1.226	0.0	3441.8	2728
5760 min Summer	0.966	0.0	3770.6	3520
7200 min Summer	0.803	0.0	3910.1	4256
8640 min Summer	0.690	0.0	4019.4	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.288	0.288	15.9	1023.0	O K
15 min Winter	0.288	0.288	15.9	1022.8	O K
30 min Winter	0.338	0.338	16.1	1208.0	O K
60 min Winter	0.395	0.395	16.1	1420.2	O K
120 min Winter	0.457	0.457	16.1	1656.4	O K
180 min Winter	0.495	0.495	16.1	1801.4	O K
240 min Winter	0.522	0.522	16.1	1904.3	O K
360 min Winter	0.558	0.558	16.1	2043.5	O K
480 min Winter	0.580	0.580	16.1	2132.7	O K
600 min Winter	0.596	0.596	16.1	2192.5	O K
720 min Winter	0.606	0.606	16.1	2232.7	O K
960 min Winter	0.616	0.616	16.1	2273.2	O K
1440 min Winter	0.615	0.615	16.1	2267.9	O K
2160 min Winter	0.600	0.600	16.1	2210.6	O K
2880 min Winter	0.577	0.577	16.1	2119.0	O K
4320 min Winter	0.494	0.494	16.1	1796.0	O K
5760 min Winter	0.414	0.414	16.1	1495.0	O K
7200 min Winter	0.345	0.345	16.1	1235.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	4095.5	5664
15 min Winter	90.095	0.0	818.4	26
30 min Winter	53.466	0.0	972.3	41
60 min Winter	31.728	0.0	1337.6	70
120 min Winter	18.829	0.0	1590.8	128
180 min Winter	13.876	0.0	1756.1	186
240 min Winter	11.174	0.0	1880.3	244
360 min Winter	8.234	0.0	2062.1	360
480 min Winter	6.631	0.0	2190.8	476
600 min Winter	5.605	0.0	2284.6	590
720 min Winter	4.887	0.0	2351.1	704
960 min Winter	3.933	0.0	2413.2	926
1440 min Winter	2.896	0.0	2339.4	1334
2160 min Winter	2.132	0.0	3416.5	1652
2880 min Winter	1.716	0.0	3645.3	2112
4320 min Winter	1.226	0.0	3832.7	2984
5760 min Winter	0.966	0.0	4226.8	3760
7200 min Winter	0.803	0.0	4385.0	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.288	0.288	15.9	1024.3	O K
10080 min Winter	0.243	0.243	15.6	858.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	4510.1	5192
10080 min Winter	0.608	0.0	4600.6	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.480

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.827	4	8	1.827	8	12	1.827

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3444.0	1.500	4708.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0178-1610-1200-1610
Design Head (m)	1.200
Design Flow (l/s)	16.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	178
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	16.1	Kick-Flo®	0.814	13.4
Flush-Flo™	0.370	16.1	Mean Flow over Head Range	-	13.8

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	6.3	1.200	16.1	3.000	24.9	7.000	37.5
0.200	15.1	1.400	17.3	3.500	26.8	7.500	38.7
0.300	16.0	1.600	18.5	4.000	28.6	8.000	40.0
0.400	16.1	1.800	19.5	4.500	30.3	8.500	41.2
0.500	15.9	2.000	20.5	5.000	31.8	9.000	42.3
0.600	15.5	2.200	21.5	5.500	33.3	9.500	43.4
0.800	13.7	2.400	22.4	6.000	34.8		
1.000	14.8	2.600	23.3	6.500	36.1		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.522	0.522	16.1	1904.8	O K
30 min Summer	0.600	0.600	16.1	2211.0	O K
60 min Summer	0.688	0.688	16.1	2559.0	O K
120 min Summer	0.785	0.785	16.1	2948.2	O K
180 min Summer	0.844	0.844	16.1	3192.1	O K
240 min Summer	0.886	0.886	16.1	3368.1	O K
360 min Summer	0.945	0.945	16.1	3613.4	O K
480 min Summer	0.984	0.984	16.1	3779.6	O K
600 min Summer	1.012	1.012	16.1	3899.2	O K
720 min Summer	1.033	1.033	16.1	3988.0	O K
960 min Summer	1.059	1.059	16.1	4102.1	O K
1440 min Summer	1.080	1.080	16.1	4190.2	O K
2160 min Summer	1.071	1.071	16.1	4153.1	O K
2880 min Summer	1.053	1.053	16.1	4075.9	O K
4320 min Summer	0.979	0.979	16.1	3756.4	O K
5760 min Summer	0.911	0.911	16.1	3469.3	O K
7200 min Summer	0.845	0.845	16.1	3195.2	O K
8640 min Summer	0.774	0.774	16.1	2906.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	1349.3	27
30 min Summer	108.845	0.0	1360.9	42
60 min Summer	63.353	0.0	2341.0	72
120 min Summer	36.874	0.0	2582.6	130
180 min Summer	26.867	0.0	2592.8	190
240 min Summer	21.462	0.0	2553.9	250
360 min Summer	15.638	0.0	2489.0	368
480 min Summer	12.492	0.0	2441.2	488
600 min Summer	10.494	0.0	2404.0	608
720 min Summer	9.102	0.0	2373.4	726
960 min Summer	7.267	0.0	2324.2	966
1440 min Summer	5.290	0.0	2258.3	1442
2160 min Summer	3.852	0.0	4795.0	2056
2880 min Summer	3.075	0.0	4619.3	2372
4320 min Summer	2.173	0.0	4210.0	3120
5760 min Summer	1.698	0.0	6623.7	3928
7200 min Summer	1.402	0.0	6823.8	4768
8640 min Summer	1.200	0.0	6985.5	5536

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.709	0.709	16.1	2640.9	O K
15 min Winter	0.581	0.581	16.1	2135.0	O K
30 min Winter	0.668	0.668	16.1	2479.3	O K
60 min Winter	0.766	0.766	16.1	2871.4	O K
120 min Winter	0.873	0.873	16.1	3311.7	O K
180 min Winter	0.939	0.939	16.1	3586.7	O K
240 min Winter	0.986	0.986	16.1	3786.1	O K
360 min Winter	1.051	1.051	16.1	4067.1	O K
480 min Winter	1.096	1.096	16.1	4260.2	O K
600 min Winter	1.128	1.128	16.1	4401.6	O K
720 min Winter	1.153	1.153	16.1	4508.6	O K
960 min Winter	1.185	1.185	16.1	4652.0	O K
1440 min Winter	1.215	1.215	16.2	4783.7	Flood Risk
2160 min Winter	1.217	1.217	16.2	4790.9	Flood Risk
2880 min Winter	1.195	1.195	16.1	4693.3	O K
4320 min Winter	1.103	1.103	16.1	4290.8	O K
5760 min Winter	1.016	1.016	16.1	3914.1	O K
7200 min Winter	0.928	0.928	16.1	3543.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	7105.7	6264
15 min Winter	187.006	0.0	1366.0	27
30 min Winter	108.845	0.0	1352.4	41
60 min Winter	63.353	0.0	2541.8	70
120 min Winter	36.874	0.0	2597.4	128
180 min Winter	26.867	0.0	2548.1	188
240 min Winter	21.462	0.0	2511.3	246
360 min Winter	15.638	0.0	2463.6	364
480 min Winter	12.492	0.0	2434.4	480
600 min Winter	10.494	0.0	2414.9	598
720 min Winter	9.102	0.0	2401.8	714
960 min Winter	7.267	0.0	2391.2	946
1440 min Winter	5.290	0.0	2385.0	1402
2160 min Winter	3.852	0.0	4867.9	2064
2880 min Winter	3.075	0.0	4723.3	2680
4320 min Winter	2.173	0.0	4394.5	3332
5760 min Winter	1.698	0.0	7410.9	4264
7200 min Winter	1.402	0.0	7624.3	5184

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.838	0.838	16.1	3166.7	O K
10080 min Winter	0.735	0.735	16.1	2745.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	7786.0	6064
10080 min Winter	1.051	0.0	7911.3	6856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.480

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.827	4	8	1.827	8	12	1.827

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3444.0	1.500	4708.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0178-1610-1200-1610
Design Head (m)	1.200
Design Flow (l/s)	16.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	178
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	16.1	Kick-Flo®	0.814	13.4
Flush-Flo™	0.370	16.1	Mean Flow over Head Range	-	13.8

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	6.3	1.200	16.1	3.000	24.9	7.000	37.5
0.200	15.1	1.400	17.3	3.500	26.8	7.500	38.7
0.300	16.0	1.600	18.5	4.000	28.6	8.000	40.0
0.400	16.1	1.800	19.5	4.500	30.3	8.500	41.2
0.500	15.9	2.000	20.5	5.000	31.8	9.000	42.3
0.600	15.5	2.200	21.5	5.500	33.3	9.500	43.4
0.800	13.7	2.400	22.4	6.000	34.8		
1.000	14.8	2.600	23.3	6.500	36.1		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.089	0.089	4.4	200.2	O K
30 min Summer	0.110	0.110	6.1	248.0	O K
60 min Summer	0.135	0.135	7.9	303.8	O K
120 min Summer	0.161	0.161	9.5	364.9	O K
180 min Summer	0.177	0.177	9.7	400.7	O K
240 min Summer	0.187	0.187	9.9	424.8	O K
360 min Summer	0.200	0.200	10.0	454.6	O K
480 min Summer	0.209	0.209	10.1	475.6	O K
600 min Summer	0.216	0.216	10.1	491.1	O K
720 min Summer	0.221	0.221	10.2	502.9	O K
960 min Summer	0.227	0.227	10.2	518.1	O K
1440 min Summer	0.232	0.232	10.2	528.7	O K
2160 min Summer	0.228	0.228	10.2	521.0	O K
2880 min Summer	0.220	0.220	10.1	501.6	O K
4320 min Summer	0.193	0.193	9.9	437.7	O K
5760 min Summer	0.171	0.171	9.7	386.2	O K
7200 min Summer	0.155	0.155	9.2	351.3	O K
8640 min Summer	0.144	0.144	8.5	324.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	140.1	26
30 min Summer	18.857	0.0	185.5	40
60 min Summer	11.811	0.0	279.0	68
120 min Summer	7.397	0.0	357.0	126
180 min Summer	5.626	0.0	411.4	184
240 min Summer	4.633	0.0	454.4	242
360 min Summer	3.524	0.0	521.7	324
480 min Summer	2.902	0.0	574.7	388
600 min Summer	2.496	0.0	618.9	452
720 min Summer	2.207	0.0	657.1	520
960 min Summer	1.817	0.0	720.4	660
1440 min Summer	1.380	0.0	815.1	936
2160 min Summer	1.049	0.0	988.8	1344
2880 min Summer	0.863	0.0	1083.3	1736
4320 min Summer	0.637	0.0	1184.5	2504
5760 min Summer	0.513	0.0	1312.3	3184
7200 min Summer	0.434	0.0	1384.1	3896
8640 min Summer	0.378	0.0	1442.5	4664

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.135	0.135	7.9	304.3	O K
15 min Winter	0.100	0.100	5.3	224.1	O K
30 min Winter	0.123	0.123	7.1	277.6	O K
60 min Winter	0.151	0.151	8.9	340.6	O K
120 min Winter	0.181	0.181	9.8	410.9	O K
180 min Winter	0.200	0.200	10.0	453.5	O K
240 min Winter	0.212	0.212	10.1	482.5	O K
360 min Winter	0.227	0.227	10.2	518.5	O K
480 min Winter	0.236	0.236	10.3	538.4	O K
600 min Winter	0.242	0.242	10.3	552.8	O K
720 min Winter	0.247	0.247	10.3	563.7	O K
960 min Winter	0.251	0.251	10.3	575.0	O K
1440 min Winter	0.251	0.251	10.3	573.6	O K
2160 min Winter	0.239	0.239	10.3	545.2	O K
2880 min Winter	0.222	0.222	10.2	505.9	O K
4320 min Winter	0.181	0.181	9.8	410.6	O K
5760 min Winter	0.155	0.155	9.1	350.0	O K
7200 min Winter	0.138	0.138	8.1	312.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	1486.4	5352
15 min Winter	30.107	0.0	161.7	26
30 min Winter	18.857	0.0	213.1	40
60 min Winter	11.811	0.0	316.2	68
120 min Winter	7.397	0.0	403.8	124
180 min Winter	5.626	0.0	464.6	180
240 min Winter	4.633	0.0	512.7	238
360 min Winter	3.524	0.0	588.1	348
480 min Winter	2.902	0.0	647.4	448
600 min Winter	2.496	0.0	696.9	482
720 min Winter	2.207	0.0	739.5	560
960 min Winter	1.817	0.0	810.3	716
1440 min Winter	1.380	0.0	915.8	1018
2160 min Winter	1.049	0.0	1110.2	1452
2880 min Winter	0.863	0.0	1216.7	1852
4320 min Winter	0.637	0.0	1332.2	2596
5760 min Winter	0.513	0.0	1471.8	3288
7200 min Winter	0.434	0.0	1552.8	4032

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.126	0.126	7.3	284.7	O K
10080 min Winter	0.117	0.117	6.7	264.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	1619.1	4752
10080 min Winter	0.337	0.0	1670.4	5448

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.600

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.200	4	8	1.200	8	12	1.200

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2213.5	1.500	3185.8

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0147-1060-1200-1060
Design Head (m)	1.200
Design Flow (l/s)	10.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	147
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	10.6	Kick-Flo®	0.780	8.6
Flush-Flo™	0.358	10.6	Mean Flow over Head Range	-	9.1

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	10.6	3.000	16.3	7.000	24.5
0.200	10.0	1.400	11.4	3.500	17.6	7.500	25.4
0.300	10.5	1.600	12.1	4.000	18.8	8.000	26.2
0.400	10.5	1.800	12.8	4.500	19.8	8.500	26.9
0.500	10.4	2.000	13.5	5.000	20.9	9.000	27.7
0.600	10.1	2.200	14.1	5.500	21.8	9.500	28.4
0.800	8.8	2.400	14.7	6.000	22.8		
1.000	9.7	2.600	15.3	6.500	23.7		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.261	0.261	10.4	598.7	O K
30 min Summer	0.307	0.307	10.5	706.8	O K
60 min Summer	0.358	0.358	10.6	830.0	O K
120 min Summer	0.413	0.413	10.6	965.8	O K
180 min Summer	0.446	0.446	10.6	1048.0	O K
240 min Summer	0.469	0.469	10.6	1105.5	O K
360 min Summer	0.500	0.500	10.6	1181.3	O K
480 min Summer	0.518	0.518	10.6	1227.7	O K
600 min Summer	0.529	0.529	10.6	1256.5	O K
720 min Summer	0.536	0.536	10.6	1273.8	O K
960 min Summer	0.541	0.541	10.6	1285.0	O K
1440 min Summer	0.541	0.541	10.6	1285.0	O K
2160 min Summer	0.531	0.531	10.6	1259.6	O K
2880 min Summer	0.514	0.514	10.6	1218.1	O K
4320 min Summer	0.455	0.455	10.6	1069.6	O K
5760 min Summer	0.401	0.401	10.6	934.7	O K
7200 min Summer	0.352	0.352	10.6	816.4	O K
8640 min Summer	0.310	0.310	10.5	715.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	503.3	26
30 min Summer	53.466	0.0	598.5	41
60 min Summer	31.728	0.0	800.5	70
120 min Summer	18.829	0.0	952.4	130
180 min Summer	13.876	0.0	1052.6	188
240 min Summer	11.174	0.0	1128.6	248
360 min Summer	8.234	0.0	1242.1	366
480 min Summer	6.631	0.0	1325.6	484
600 min Summer	5.605	0.0	1390.2	602
720 min Summer	4.887	0.0	1440.8	722
960 min Summer	3.933	0.0	1507.6	914
1440 min Summer	2.896	0.0	1519.3	1142
2160 min Summer	2.132	0.0	2023.6	1524
2880 min Summer	1.716	0.0	2164.0	1936
4320 min Summer	1.226	0.0	2290.9	2732
5760 min Summer	0.966	0.0	2485.1	3520
7200 min Summer	0.803	0.0	2578.2	4256
8640 min Summer	0.690	0.0	2652.6	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.274	0.274	10.4	629.3	O K
15 min Winter	0.292	0.292	10.5	671.4	O K
30 min Winter	0.342	0.342	10.6	793.0	O K
60 min Winter	0.399	0.399	10.6	932.0	O K
120 min Winter	0.462	0.462	10.6	1086.5	O K
180 min Winter	0.500	0.500	10.6	1181.0	O K
240 min Winter	0.526	0.526	10.6	1247.9	O K
360 min Winter	0.561	0.561	10.6	1338.1	O K
480 min Winter	0.584	0.584	10.6	1395.4	O K
600 min Winter	0.599	0.599	10.6	1433.6	O K
720 min Winter	0.608	0.608	10.6	1458.9	O K
960 min Winter	0.618	0.618	10.6	1483.4	O K
1440 min Winter	0.615	0.615	10.6	1475.7	O K
2160 min Winter	0.597	0.597	10.6	1430.3	O K
2880 min Winter	0.572	0.572	10.6	1364.8	O K
4320 min Winter	0.485	0.485	10.6	1144.8	O K
5760 min Winter	0.404	0.404	10.6	942.8	O K
7200 min Winter	0.333	0.333	10.5	770.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	2706.9	5664
15 min Winter	90.095	0.0	565.5	26
30 min Winter	53.466	0.0	667.6	41
60 min Winter	31.728	0.0	898.8	70
120 min Winter	18.829	0.0	1067.4	128
180 min Winter	13.876	0.0	1177.7	186
240 min Winter	11.174	0.0	1260.7	244
360 min Winter	8.234	0.0	1382.4	360
480 min Winter	6.631	0.0	1468.4	476
600 min Winter	5.605	0.0	1530.3	590
720 min Winter	4.887	0.0	1572.4	704
960 min Winter	3.933	0.0	1603.4	926
1440 min Winter	2.896	0.0	1546.6	1340
2160 min Winter	2.132	0.0	2264.5	1664
2880 min Winter	1.716	0.0	2418.9	2112
4320 min Winter	1.226	0.0	2551.8	2984
5760 min Winter	0.966	0.0	2785.0	3760
7200 min Winter	0.803	0.0	2890.4	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.275	0.275	10.4	630.4	O K
10080 min Winter	0.228	0.228	10.2	520.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	2975.0	5192
10080 min Winter	0.608	0.0	3039.0	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.600

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.200	4	8	1.200	8	12	1.200

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2213.5	1.500	3185.8

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0147-1060-1200-1060
Design Head (m)	1.200
Design Flow (l/s)	10.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	147
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	10.6	Kick-Flo®	0.780	8.6
Flush-Flo™	0.358	10.6	Mean Flow over Head Range	-	9.1

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	10.6	3.000	16.3	7.000	24.5
0.200	10.0	1.400	11.4	3.500	17.6	7.500	25.4
0.300	10.5	1.600	12.1	4.000	18.8	8.000	26.2
0.400	10.5	1.800	12.8	4.500	19.8	8.500	26.9
0.500	10.4	2.000	13.5	5.000	20.9	9.000	27.7
0.600	10.1	2.200	14.1	5.500	21.8	9.500	28.4
0.800	8.8	2.400	14.7	6.000	22.8		
1.000	9.7	2.600	15.3	6.500	23.7		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.527	0.527	10.6	1251.1	O K
30 min Summer	0.606	0.606	10.6	1452.2	O K
60 min Summer	0.693	0.693	10.6	1680.6	O K
120 min Summer	0.789	0.789	10.6	1936.2	O K
180 min Summer	0.847	0.847	10.6	2095.3	O K
240 min Summer	0.889	0.889	10.6	2209.7	O K
360 min Summer	0.946	0.946	10.6	2368.8	O K
480 min Summer	0.984	0.984	10.6	2476.2	O K
600 min Summer	1.011	1.011	10.6	2553.2	O K
720 min Summer	1.031	1.031	10.6	2610.0	O K
960 min Summer	1.056	1.056	10.6	2682.1	O K
1440 min Summer	1.075	1.075	10.6	2734.9	O K
2160 min Summer	1.064	1.064	10.6	2704.2	O K
2880 min Summer	1.044	1.044	10.6	2648.3	O K
4320 min Summer	0.969	0.969	10.6	2432.3	O K
5760 min Summer	0.901	0.901	10.6	2242.4	O K
7200 min Summer	0.836	0.836	10.6	2064.8	O K
8640 min Summer	0.769	0.769	10.6	1882.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	890.1	27
30 min Summer	108.845	0.0	890.6	42
60 min Summer	63.353	0.0	1564.6	72
120 min Summer	36.874	0.0	1698.5	130
180 min Summer	26.867	0.0	1682.2	190
240 min Summer	21.462	0.0	1656.9	250
360 min Summer	15.638	0.0	1617.1	368
480 min Summer	12.492	0.0	1588.9	488
600 min Summer	10.494	0.0	1567.6	608
720 min Summer	9.102	0.0	1550.6	726
960 min Summer	7.267	0.0	1525.1	966
1440 min Summer	5.290	0.0	1500.0	1442
2160 min Summer	3.852	0.0	3153.0	2056
2880 min Summer	3.075	0.0	3042.8	2376
4320 min Summer	2.173	0.0	2783.4	3120
5760 min Summer	1.698	0.0	4365.1	3928
7200 min Summer	1.402	0.0	4498.9	4768
8640 min Summer	1.200	0.0	4607.4	5616

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.701	0.701	10.6	1700.9	O K
15 min Winter	0.587	0.587	10.6	1402.4	O K
30 min Winter	0.674	0.674	10.6	1628.5	O K
60 min Winter	0.770	0.770	10.6	1886.1	O K
120 min Winter	0.876	0.876	10.6	2174.4	O K
180 min Winter	0.941	0.941	10.6	2354.2	O K
240 min Winter	0.987	0.987	10.6	2484.4	O K
360 min Winter	1.051	1.051	10.6	2667.6	O K
480 min Winter	1.095	1.095	10.6	2793.1	O K
600 min Winter	1.126	1.126	10.6	2884.7	O K
720 min Winter	1.150	1.150	10.6	2953.8	O K
960 min Winter	1.181	1.181	10.6	3045.6	O K
1440 min Winter	1.208	1.208	10.6	3128.0	Flood Risk
2160 min Winter	1.208	1.208	10.6	3127.4	Flood Risk
2880 min Winter	1.185	1.185	10.6	3058.8	O K
4320 min Winter	1.093	1.093	10.6	2787.6	O K
5760 min Winter	1.006	1.006	10.6	2537.6	O K
7200 min Winter	0.920	0.920	10.6	2294.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	4692.5	6352
15 min Winter	187.006	0.0	894.8	27
30 min Winter	108.845	0.0	880.9	41
60 min Winter	63.353	0.0	1684.4	70
120 min Winter	36.874	0.0	1684.3	128
180 min Winter	26.867	0.0	1652.4	188
240 min Winter	21.462	0.0	1630.0	246
360 min Winter	15.638	0.0	1602.4	364
480 min Winter	12.492	0.0	1587.1	480
600 min Winter	10.494	0.0	1578.6	598
720 min Winter	9.102	0.0	1575.3	714
960 min Winter	7.267	0.0	1581.0	946
1440 min Winter	5.290	0.0	1581.6	1402
2160 min Winter	3.852	0.0	3196.3	2064
2880 min Winter	3.075	0.0	3108.1	2684
4320 min Winter	2.173	0.0	2909.0	3332
5760 min Winter	1.698	0.0	4884.8	4264
7200 min Winter	1.402	0.0	5029.1	5192

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.832	0.832	10.6	2052.5	O K
10080 min Winter	0.730	0.730	10.6	1777.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	5138.4	6064
10080 min Winter	1.051	0.0	5224.4	6864

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.600

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.200	4	8	1.200	8	12	1.200

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2213.5	1.500	3185.8

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0147-1060-1200-1060
Design Head (m)	1.200
Design Flow (l/s)	10.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	147
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	10.6	Kick-Flo®	0.780	8.6
Flush-Flo™	0.358	10.6	Mean Flow over Head Range	-	9.1

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	10.6	3.000	16.3	7.000	24.5
0.200	10.0	1.400	11.4	3.500	17.6	7.500	25.4
0.300	10.5	1.600	12.1	4.000	18.8	8.000	26.2
0.400	10.5	1.800	12.8	4.500	19.8	8.500	26.9
0.500	10.4	2.000	13.5	5.000	20.9	9.000	27.7
0.600	10.1	2.200	14.1	5.500	21.8	9.500	28.4
0.800	8.8	2.400	14.7	6.000	22.8		
1.000	9.7	2.600	15.3	6.500	23.7		

Summary of Results for 1 year Return Period

Half Drain Time : 17 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.140	0.140	90.1	127.6	O K
30 min Summer	0.156	0.156	91.5	142.4	O K
60 min Summer	0.154	0.154	91.3	140.5	O K
120 min Summer	0.133	0.133	89.4	121.1	O K
180 min Summer	0.111	0.111	87.4	100.0	O K
240 min Summer	0.091	0.091	85.5	81.5	O K
360 min Summer	0.061	0.061	82.9	54.8	O K
480 min Summer	0.048	0.048	78.9	42.7	O K
600 min Summer	0.042	0.042	68.8	37.7	O K
720 min Summer	0.038	0.038	62.2	33.8	O K
960 min Summer	0.032	0.032	52.2	28.4	O K
1440 min Summer	0.025	0.025	39.9	22.0	O K
2160 min Summer	0.019	0.019	30.9	16.8	O K
2880 min Summer	0.016	0.016	25.3	14.0	O K
4320 min Summer	0.012	0.012	18.8	10.2	O K
5760 min Summer	0.010	0.010	15.6	8.4	O K
7200 min Summer	0.008	0.008	13.2	7.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	20
30 min Summer	18.857	0.0	29
60 min Summer	11.811	0.0	46
120 min Summer	7.397	0.0	78
180 min Summer	5.626	0.0	110
240 min Summer	4.633	0.0	140
360 min Summer	3.524	0.0	196
480 min Summer	2.902	0.0	252
600 min Summer	2.496	0.0	314
720 min Summer	2.207	0.0	374
960 min Summer	1.817	0.0	492
1440 min Summer	1.380	0.0	736
2160 min Summer	1.049	0.0	1104
2880 min Summer	0.863	0.0	1468
4320 min Summer	0.637	0.0	2164
5760 min Summer	0.513	0.0	2896
7200 min Summer	0.434	0.0	3552

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	0.007	0.007	11.6	6.2	O K
10080 min Summer	0.006	0.006	10.0	5.5	O K
15 min Winter	0.161	0.161	92.0	147.2	O K
30 min Winter	0.178	0.178	93.5	163.9	O K
60 min Winter	0.170	0.170	92.8	155.7	O K
120 min Winter	0.132	0.132	89.3	120.0	O K
180 min Winter	0.095	0.095	85.9	85.8	O K
240 min Winter	0.066	0.066	83.3	59.3	O K
360 min Winter	0.045	0.045	73.0	39.5	O K
480 min Winter	0.037	0.037	60.5	33.0	O K
600 min Winter	0.032	0.032	52.2	28.6	O K
720 min Winter	0.029	0.029	46.5	25.4	O K
960 min Winter	0.024	0.024	38.3	21.0	O K
1440 min Winter	0.018	0.018	29.3	15.9	O K
2160 min Winter	0.014	0.014	22.8	12.4	O K
2880 min Winter	0.012	0.012	18.8	10.2	O K
4320 min Winter	0.009	0.009	14.0	7.5	O K
5760 min Winter	0.007	0.007	11.6	6.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
8640 min Summer	0.378	0.0	4288
10080 min Summer	0.337	0.0	5064
15 min Winter	30.107	0.0	21
30 min Winter	18.857	0.0	31
60 min Winter	11.811	0.0	48
120 min Winter	7.397	0.0	82
180 min Winter	5.626	0.0	114
240 min Winter	4.633	0.0	142
360 min Winter	3.524	0.0	194
480 min Winter	2.902	0.0	254
600 min Winter	2.496	0.0	316
720 min Winter	2.207	0.0	374
960 min Winter	1.817	0.0	498
1440 min Winter	1.380	0.0	734
2160 min Winter	1.049	0.0	1112
2880 min Winter	0.863	0.0	1484
4320 min Winter	0.637	0.0	2204
5760 min Winter	0.513	0.0	2864

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
7200 min Winter	0.006	0.006	10.0	5.4	O K
8640 min Winter	0.005	0.005	8.4	4.5	O K
10080 min Winter	0.005	0.005	7.6	4.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
7200 min Winter	0.434	0.0	3664
8640 min Winter	0.378	0.0	4312
10080 min Winter	0.337	0.0	5200

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.600

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.200	4	8	1.200	8	12	1.200

Model Details

Storage is Online Cover Level (m) 1.500

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.63480 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.63480

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	877.0	1.500	1702.0

Summary of Results for 30 year Return Period

Half Drain Time : 46 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.492	0.492	123.0	489.8	O K
30 min Summer	0.533	0.533	126.9	536.2	O K
60 min Summer	0.533	0.533	126.8	535.6	O K
120 min Summer	0.498	0.498	123.5	495.7	O K
180 min Summer	0.460	0.460	119.9	453.7	O K
240 min Summer	0.423	0.423	116.4	413.5	O K
360 min Summer	0.355	0.355	110.0	341.0	O K
480 min Summer	0.295	0.295	104.3	278.9	O K
600 min Summer	0.243	0.243	99.5	226.6	O K
720 min Summer	0.198	0.198	95.3	182.8	O K
960 min Summer	0.128	0.128	88.9	115.9	O K
1440 min Summer	0.053	0.053	82.1	47.3	O K
2160 min Summer	0.039	0.039	63.0	34.1	O K
2880 min Summer	0.031	0.031	50.6	27.5	O K
4320 min Summer	0.023	0.023	36.6	19.9	O K
5760 min Summer	0.018	0.018	28.5	15.7	O K
7200 min Summer	0.015	0.015	23.6	13.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	22
30 min Summer	53.466	0.0	33
60 min Summer	31.728	0.0	52
120 min Summer	18.829	0.0	86
180 min Summer	13.876	0.0	120
240 min Summer	11.174	0.0	154
360 min Summer	8.234	0.0	218
480 min Summer	6.631	0.0	282
600 min Summer	5.605	0.0	342
720 min Summer	4.887	0.0	402
960 min Summer	3.933	0.0	520
1440 min Summer	2.896	0.0	740
2160 min Summer	2.132	0.0	1100
2880 min Summer	1.716	0.0	1448
4320 min Summer	1.226	0.0	2176
5760 min Summer	0.966	0.0	2864
7200 min Summer	0.803	0.0	3560

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	0.013	0.013	20.4	11.2	O K
10080 min Summer	0.011	0.011	18.0	9.9	O K
15 min Winter	0.551	0.551	128.6	556.2	O K
30 min Winter	0.600	0.600	133.3	613.5	O K
60 min Winter	0.604	0.604	133.7	617.8	O K
120 min Winter	0.555	0.555	129.0	560.8	O K
180 min Winter	0.498	0.498	123.5	495.7	O K
240 min Winter	0.442	0.442	118.2	434.0	O K
360 min Winter	0.341	0.341	108.6	326.4	O K
480 min Winter	0.255	0.255	100.7	239.0	O K
600 min Winter	0.184	0.184	94.1	169.1	O K
720 min Winter	0.126	0.126	88.7	113.8	O K
960 min Winter	0.052	0.052	82.0	46.2	O K
1440 min Winter	0.038	0.038	61.3	33.4	O K
2160 min Winter	0.028	0.028	45.6	24.8	O K
2880 min Winter	0.023	0.023	36.6	19.9	O K
4320 min Winter	0.016	0.016	26.1	14.2	O K
5760 min Winter	0.013	0.013	21.2	11.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
8640 min Summer	0.690	0.0	4296
10080 min Summer	0.608	0.0	5064
15 min Winter	90.095	0.0	23
30 min Winter	53.466	0.0	34
60 min Winter	31.728	0.0	56
120 min Winter	18.829	0.0	92
180 min Winter	13.876	0.0	128
240 min Winter	11.174	0.0	164
360 min Winter	8.234	0.0	232
480 min Winter	6.631	0.0	294
600 min Winter	5.605	0.0	356
720 min Winter	4.887	0.0	412
960 min Winter	3.933	0.0	502
1440 min Winter	2.896	0.0	738
2160 min Winter	2.132	0.0	1104
2880 min Winter	1.716	0.0	1468
4320 min Winter	1.226	0.0	2128
5760 min Winter	0.966	0.0	2904

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
7200 min Winter	0.011	0.011	17.2	9.4	O K
8640 min Winter	0.009	0.009	14.8	8.1	O K
10080 min Winter	0.008	0.008	13.2	7.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
7200 min Winter	0.803	0.0	3544
8640 min Winter	0.690	0.0	4376
10080 min Winter	0.608	0.0	4960

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.600

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.200	4	8	1.200	8	12	1.200

Model Details

Storage is Online Cover Level (m) 1.500

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.63480 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.63480

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	877.0	1.500	1702.0

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

Half Drain Time : 76 minutes.

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15	min Summer	0.978	0.978	170.6	1096.0	O K
30	min Summer	1.055	1.055	178.4	1204.3	O K
60	min Summer	1.080	1.080	180.9	1240.5	O K
120	min Summer	1.043	1.043	177.2	1187.2	O K
180	min Summer	0.993	0.993	172.1	1117.4	O K
240	min Summer	0.945	0.945	167.3	1051.4	O K
360	min Summer	0.859	0.859	158.7	935.6	O K
480	min Summer	0.781	0.781	151.0	834.5	O K
600	min Summer	0.710	0.710	144.0	745.3	O K
720	min Summer	0.645	0.645	137.7	666.3	O K
960	min Summer	0.531	0.531	126.7	533.3	O K
1440	min Summer	0.355	0.355	110.0	341.1	O K
2160	min Summer	0.179	0.179	93.6	164.5	O K
2880	min Summer	0.077	0.077	84.3	69.1	O K
4320	min Summer	0.039	0.039	63.8	34.7	O K
5760	min Summer	0.031	0.031	50.6	27.5	O K
7200	min Summer	0.026	0.026	41.5	22.7	O K

	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15	min Summer	187.006	0.0	23
30	min Summer	108.845	0.0	35
60	min Summer	63.353	0.0	60
120	min Summer	36.874	0.0	92
180	min Summer	26.867	0.0	126
240	min Summer	21.462	0.0	160
360	min Summer	15.638	0.0	228
480	min Summer	12.492	0.0	294
600	min Summer	10.494	0.0	358
720	min Summer	9.102	0.0	422
960	min Summer	7.267	0.0	546
1440	min Summer	5.290	0.0	788
2160	min Summer	3.852	0.0	1148
2880	min Summer	3.075	0.0	1480
4320	min Summer	2.173	0.0	2200
5760	min Summer	1.698	0.0	2920
7200	min Summer	1.402	0.0	3600

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	0.022	0.022	35.8	19.4	O K
10080 min Summer	0.019	0.019	30.9	17.0	O K
15 min Winter	1.079	1.079	180.8	1238.9	O K
30 min Winter	1.167	1.167	189.8	1368.1	O K
60 min Winter	1.205	1.205	193.7	1424.9	Flood Risk
120 min Winter	1.163	1.163	189.4	1361.8	O K
180 min Winter	1.099	1.099	182.9	1267.5	O K
240 min Winter	1.030	1.030	175.8	1168.9	O K
360 min Winter	0.905	0.905	163.3	997.3	O K
480 min Winter	0.794	0.794	152.2	850.7	O K
600 min Winter	0.693	0.693	142.4	725.4	O K
720 min Winter	0.604	0.604	133.7	618.1	O K
960 min Winter	0.452	0.452	119.2	445.4	O K
1440 min Winter	0.230	0.230	98.3	214.3	O K
2160 min Winter	0.050	0.050	81.9	44.5	O K
2880 min Winter	0.040	0.040	65.5	35.5	O K
4320 min Winter	0.029	0.029	46.5	25.2	O K
5760 min Winter	0.023	0.023	36.6	19.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
8640 min Summer	1.200	0.0	4288
10080 min Summer	1.051	0.0	5056
15 min Winter	187.006	0.0	24
30 min Winter	108.845	0.0	36
60 min Winter	63.353	0.0	60
120 min Winter	36.874	0.0	98
180 min Winter	26.867	0.0	136
240 min Winter	21.462	0.0	172
360 min Winter	15.638	0.0	244
480 min Winter	12.492	0.0	312
600 min Winter	10.494	0.0	378
720 min Winter	9.102	0.0	444
960 min Winter	7.267	0.0	570
1440 min Winter	5.290	0.0	810
2160 min Winter	3.852	0.0	1088
2880 min Winter	3.075	0.0	1448
4320 min Winter	2.173	0.0	2172
5760 min Winter	1.698	0.0	2856

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
7200 min Winter	0.019	0.019	30.1	16.4	O K
8640 min Winter	0.016	0.016	26.1	14.2	O K
10080 min Winter	0.014	0.014	22.8	12.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
7200 min Winter	1.402	0.0	3744
8640 min Winter	1.200	0.0	4416
10080 min Winter	1.051	0.0	5072

Model Details

Storage is Online Cover Level (m) 1.500

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.63480 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.63480

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	877.0	1.500	1702.0

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.600

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.200	4	8	1.200	8	12	1.200

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.098	0.098	2.5	63.7	O K
30 min Summer	0.120	0.120	2.8	78.6	O K
60 min Summer	0.146	0.146	3.0	96.2	O K
120 min Summer	0.174	0.174	3.1	115.5	O K
180 min Summer	0.190	0.190	3.2	126.6	O K
240 min Summer	0.201	0.201	3.2	133.8	O K
360 min Summer	0.213	0.213	3.2	142.2	O K
480 min Summer	0.221	0.221	3.3	147.7	O K
600 min Summer	0.226	0.226	3.3	151.5	O K
720 min Summer	0.230	0.230	3.3	154.2	O K
960 min Summer	0.234	0.234	3.3	156.9	O K
1440 min Summer	0.233	0.233	3.3	156.7	O K
2160 min Summer	0.224	0.224	3.3	150.4	O K
2880 min Summer	0.212	0.212	3.2	141.7	O K
4320 min Summer	0.179	0.179	3.1	118.6	O K
5760 min Summer	0.152	0.152	3.0	100.3	O K
7200 min Summer	0.131	0.131	2.9	86.3	O K
8640 min Summer	0.116	0.116	2.8	75.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	56.3	26
30 min Summer	18.857	0.0	72.2	40
60 min Summer	11.811	0.0	97.8	68
120 min Summer	7.397	0.0	123.4	126
180 min Summer	5.626	0.0	141.3	184
240 min Summer	4.633	0.0	155.4	242
360 min Summer	3.524	0.0	177.7	322
480 min Summer	2.902	0.0	195.3	386
600 min Summer	2.496	0.0	210.0	452
720 min Summer	2.207	0.0	222.8	520
960 min Summer	1.817	0.0	244.3	658
1440 min Summer	1.380	0.0	277.3	936
2160 min Summer	1.049	0.0	324.9	1344
2880 min Summer	0.863	0.0	356.3	1736
4320 min Summer	0.637	0.0	392.1	2508
5760 min Summer	0.513	0.0	426.5	3232
7200 min Summer	0.434	0.0	450.4	3904
8640 min Summer	0.378	0.0	470.4	4592

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.105	0.105	2.7	68.7	O K
15 min Winter	0.109	0.109	2.7	71.3	O K
30 min Winter	0.134	0.134	2.9	88.3	O K
60 min Winter	0.164	0.164	3.1	108.3	O K
120 min Winter	0.196	0.196	3.2	130.5	O K
180 min Winter	0.215	0.215	3.2	143.5	O K
240 min Winter	0.227	0.227	3.3	152.1	O K
360 min Winter	0.241	0.241	3.3	162.4	O K
480 min Winter	0.249	0.249	3.3	167.6	O K
600 min Winter	0.254	0.254	3.3	171.0	O K
720 min Winter	0.257	0.257	3.3	173.4	O K
960 min Winter	0.259	0.259	3.3	174.9	O K
1440 min Winter	0.253	0.253	3.3	170.9	O K
2160 min Winter	0.235	0.235	3.3	157.9	O K
2880 min Winter	0.213	0.213	3.2	142.7	O K
4320 min Winter	0.165	0.165	3.1	108.9	O K
5760 min Winter	0.129	0.129	2.9	84.9	O K
7200 min Winter	0.107	0.107	2.7	70.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	486.8	5344
15 min Winter	30.107	0.0	63.9	26
30 min Winter	18.857	0.0	81.6	40
60 min Winter	11.811	0.0	110.0	68
120 min Winter	7.397	0.0	138.7	124
180 min Winter	5.626	0.0	158.7	180
240 min Winter	4.633	0.0	174.5	238
360 min Winter	3.524	0.0	199.4	348
480 min Winter	2.902	0.0	219.1	448
600 min Winter	2.496	0.0	235.7	482
720 min Winter	2.207	0.0	250.0	558
960 min Winter	1.817	0.0	274.0	716
1440 min Winter	1.380	0.0	310.7	1018
2160 min Winter	1.049	0.0	364.2	1452
2880 min Winter	0.863	0.0	399.5	1856
4320 min Winter	0.637	0.0	439.9	2604
5760 min Winter	0.513	0.0	477.9	3304
7200 min Winter	0.434	0.0	504.8	3960

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.095	0.095	2.4	61.8	O K
10080 min Winter	0.086	0.086	2.2	55.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	527.4	4672
10080 min Winter	0.337	0.0	546.1	5352

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.160

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.387	4	8	0.387	8	12	0.387

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	638.0	1.500	1130.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0085-3400-1200-3400
Design Head (m)	1.200
Design Flow (l/s)	3.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	85
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.4	Kick-Flo®	0.743	2.7
Flush-Flo™	0.363	3.4	Mean Flow over Head Range	-	3.0

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	2.5	1.200	3.4	3.000	5.2	7.000	7.7
0.200	3.2	1.400	3.6	3.500	5.6	7.500	8.0
0.300	3.4	1.600	3.9	4.000	5.9	8.000	8.3
0.400	3.4	1.800	4.1	4.500	6.3	8.500	8.5
0.500	3.3	2.000	4.3	5.000	6.6	9.000	8.7
0.600	3.2	2.200	4.5	5.500	6.9	9.500	9.0
0.800	2.8	2.400	4.7	6.000	7.2		
1.000	3.1	2.600	4.9	6.500	7.5		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.284	0.284	3.4	192.6	O K
30 min Summer	0.331	0.331	3.4	227.3	O K
60 min Summer	0.384	0.384	3.4	266.7	O K
120 min Summer	0.441	0.441	3.4	309.6	O K
180 min Summer	0.474	0.474	3.4	335.4	O K
240 min Summer	0.497	0.497	3.4	353.1	O K
360 min Summer	0.526	0.526	3.4	376.2	O K
480 min Summer	0.543	0.543	3.4	389.8	O K
600 min Summer	0.553	0.553	3.4	397.9	O K
720 min Summer	0.559	0.559	3.4	402.3	O K
960 min Summer	0.561	0.561	3.4	403.7	O K
1440 min Summer	0.555	0.555	3.4	399.4	O K
2160 min Summer	0.539	0.539	3.4	386.6	O K
2880 min Summer	0.519	0.519	3.4	370.3	O K
4320 min Summer	0.454	0.454	3.4	319.9	O K
5760 min Summer	0.397	0.397	3.4	275.8	O K
7200 min Summer	0.346	0.346	3.4	237.7	O K
8640 min Summer	0.301	0.301	3.4	205.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	178.9	26
30 min Summer	53.466	0.0	210.8	41
60 min Summer	31.728	0.0	268.6	70
120 min Summer	18.829	0.0	318.9	130
180 min Summer	13.876	0.0	352.2	188
240 min Summer	11.174	0.0	377.7	248
360 min Summer	8.234	0.0	416.0	366
480 min Summer	6.631	0.0	444.6	484
600 min Summer	5.605	0.0	466.8	604
720 min Summer	4.887	0.0	484.2	722
960 min Summer	3.933	0.0	505.4	920
1440 min Summer	2.896	0.0	502.8	1144
2160 min Summer	2.132	0.0	661.8	1532
2880 min Summer	1.716	0.0	709.1	1936
4320 min Summer	1.226	0.0	755.4	2732
5760 min Summer	0.966	0.0	804.7	3520
7200 min Summer	0.803	0.0	835.6	4256
8640 min Summer	0.690	0.0	861.1	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.263	0.263	3.3	177.6	O K
15 min Winter	0.316	0.316	3.4	216.0	O K
30 min Winter	0.369	0.369	3.4	255.1	O K
60 min Winter	0.428	0.428	3.4	299.6	O K
120 min Winter	0.491	0.491	3.4	348.7	O K
180 min Winter	0.529	0.529	3.4	378.5	O K
240 min Winter	0.555	0.555	3.4	399.5	O K
360 min Winter	0.590	0.590	3.4	427.4	O K
480 min Winter	0.611	0.611	3.4	445.0	O K
600 min Winter	0.625	0.625	3.4	456.4	O K
720 min Winter	0.634	0.634	3.4	463.7	O K
960 min Winter	0.642	0.642	3.4	470.0	O K
1440 min Winter	0.635	0.635	3.4	464.4	O K
2160 min Winter	0.611	0.611	3.4	444.3	O K
2880 min Winter	0.580	0.580	3.4	419.7	O K
4320 min Winter	0.487	0.487	3.4	345.0	O K
5760 min Winter	0.401	0.401	3.4	279.0	O K
7200 min Winter	0.326	0.326	3.4	223.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	881.5	5744
15 min Winter	90.095	0.0	199.8	26
30 min Winter	53.466	0.0	233.5	41
60 min Winter	31.728	0.0	301.0	70
120 min Winter	18.829	0.0	356.9	128
180 min Winter	13.876	0.0	393.8	186
240 min Winter	11.174	0.0	421.8	244
360 min Winter	8.234	0.0	463.0	360
480 min Winter	6.631	0.0	492.0	476
600 min Winter	5.605	0.0	511.7	590
720 min Winter	4.887	0.0	522.7	704
960 min Winter	3.933	0.0	524.1	928
1440 min Winter	2.896	0.0	507.0	1348
2160 min Winter	2.132	0.0	740.7	1668
2880 min Winter	1.716	0.0	793.1	2128
4320 min Winter	1.226	0.0	842.8	2984
5760 min Winter	0.966	0.0	901.5	3760
7200 min Winter	0.803	0.0	936.2	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.265	0.265	3.3	179.1	O K
10080 min Winter	0.216	0.216	3.2	144.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	964.9	5200
10080 min Winter	0.608	0.0	988.4	5944

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.160

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.387	4	8	0.387	8	12	0.387

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	638.0	1.500	1130.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0085-3400-1200-3400
Design Head (m)	1.200
Design Flow (l/s)	3.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	85
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.4	Kick-Flo®	0.743	2.7
Flush-Flo™	0.363	3.4	Mean Flow over Head Range	-	3.0

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	2.5	1.200	3.4	3.000	5.2	7.000	7.7
0.200	3.2	1.400	3.6	3.500	5.6	7.500	8.0
0.300	3.4	1.600	3.9	4.000	5.9	8.000	8.3
0.400	3.4	1.800	4.1	4.500	6.3	8.500	8.5
0.500	3.3	2.000	4.3	5.000	6.6	9.000	8.7
0.600	3.2	2.200	4.5	5.500	6.9	9.500	9.0
0.800	2.8	2.400	4.7	6.000	7.2		
1.000	3.1	2.600	4.9	6.500	7.5		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.560	0.560	3.4	402.9	O K
30 min Summer	0.639	0.639	3.4	467.6	O K
60 min Summer	0.726	0.726	3.4	541.1	O K
120 min Summer	0.819	0.819	3.4	622.8	O K
180 min Summer	0.875	0.875	3.4	673.2	O K
240 min Summer	0.915	0.915	3.4	709.3	O K
360 min Summer	0.968	0.968	3.4	759.3	O K
480 min Summer	1.004	1.004	3.4	792.7	O K
600 min Summer	1.029	1.029	3.4	816.5	O K
720 min Summer	1.047	1.047	3.4	833.7	O K
960 min Summer	1.069	1.069	3.4	855.0	O K
1440 min Summer	1.083	1.083	3.4	868.7	O K
2160 min Summer	1.068	1.068	3.4	854.6	O K
2880 min Summer	1.046	1.046	3.4	833.2	O K
4320 min Summer	0.969	0.969	3.4	759.7	O K
5760 min Summer	0.902	0.902	3.4	697.9	O K
7200 min Summer	0.840	0.840	3.4	641.7	O K
8640 min Summer	0.780	0.780	3.4	587.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	287.0	27
30 min Summer	108.845	0.0	284.7	42
60 min Summer	63.353	0.0	520.3	72
120 min Summer	36.874	0.0	540.2	130
180 min Summer	26.867	0.0	532.9	190
240 min Summer	21.462	0.0	525.5	250
360 min Summer	15.638	0.0	514.7	368
480 min Summer	12.492	0.0	507.6	488
600 min Summer	10.494	0.0	502.7	608
720 min Summer	9.102	0.0	499.4	726
960 min Summer	7.267	0.0	496.3	966
1440 min Summer	5.290	0.0	497.0	1442
2160 min Summer	3.852	0.0	1023.7	2056
2880 min Summer	3.075	0.0	991.6	2392
4320 min Summer	2.173	0.0	913.6	3120
5760 min Summer	1.698	0.0	1413.8	3936
7200 min Summer	1.402	0.0	1458.5	4768
8640 min Summer	1.200	0.0	1495.3	5624

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.712	0.712	3.4	528.9	O K
15 min Winter	0.620	0.620	3.4	451.7	O K
30 min Winter	0.706	0.706	3.4	524.6	O K
60 min Winter	0.802	0.802	3.4	607.4	O K
120 min Winter	0.904	0.904	3.4	699.5	O K
180 min Winter	0.966	0.966	3.4	756.8	O K
240 min Winter	1.010	1.010	3.4	798.2	O K
360 min Winter	1.070	1.070	3.4	856.3	O K
480 min Winter	1.110	1.110	3.4	895.8	O K
600 min Winter	1.139	1.139	3.4	924.4	O K
720 min Winter	1.160	1.160	3.4	945.9	O K
960 min Winter	1.188	1.188	3.4	974.0	O K
1440 min Winter	1.211	1.211	3.4	997.8	Flood Risk
2160 min Winter	1.208	1.208	3.4	994.1	Flood Risk
2880 min Winter	1.183	1.183	3.4	968.9	O K
4320 min Winter	1.091	1.091	3.4	876.7	O K
5760 min Winter	1.006	1.006	3.4	794.7	O K
7200 min Winter	0.923	0.923	3.4	716.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	1525.8	6360
15 min Winter	187.006	0.0	286.7	27
30 min Winter	108.845	0.0	277.7	41
60 min Winter	63.353	0.0	542.3	70
120 min Winter	36.874	0.0	532.8	128
180 min Winter	26.867	0.0	523.5	188
240 min Winter	21.462	0.0	517.4	246
360 min Winter	15.638	0.0	510.9	364
480 min Winter	12.492	0.0	508.7	480
600 min Winter	10.494	0.0	509.5	598
720 min Winter	9.102	0.0	512.5	714
960 min Winter	7.267	0.0	518.6	946
1440 min Winter	5.290	0.0	520.1	1404
2160 min Winter	3.852	0.0	1034.0	2064
2880 min Winter	3.075	0.0	1009.7	2684
4320 min Winter	2.173	0.0	957.4	3332
5760 min Winter	1.698	0.0	1582.8	4264
7200 min Winter	1.402	0.0	1632.1	5192

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.840	0.840	3.4	641.0	O K
10080 min Winter	0.749	0.749	3.4	561.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	1670.7	6064
10080 min Winter	1.051	0.0	1698.9	6968

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.160

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.387	4	8	0.387	8	12	0.387

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	638.0	1.500	1130.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0085-3400-1200-3400
Design Head (m)	1.200
Design Flow (l/s)	3.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	85
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.4	Kick-Flo®	0.743	2.7
Flush-Flo™	0.363	3.4	Mean Flow over Head Range	-	3.0

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	2.5	1.200	3.4	3.000	5.2	7.000	7.7
0.200	3.2	1.400	3.6	3.500	5.6	7.500	8.0
0.300	3.4	1.600	3.9	4.000	5.9	8.000	8.3
0.400	3.4	1.800	4.1	4.500	6.3	8.500	8.5
0.500	3.3	2.000	4.3	5.000	6.6	9.000	8.7
0.600	3.2	2.200	4.5	5.500	6.9	9.500	9.0
0.800	2.8	2.400	4.7	6.000	7.2		
1.000	3.1	2.600	4.9	6.500	7.5		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.101	0.101	2.6	64.7	O K
30 min Summer	0.124	0.124	2.9	79.9	O K
60 min Summer	0.151	0.151	3.1	97.7	O K
120 min Summer	0.180	0.180	3.2	117.2	O K
180 min Summer	0.196	0.196	3.3	128.4	O K
240 min Summer	0.206	0.206	3.3	135.6	O K
360 min Summer	0.218	0.218	3.3	143.9	O K
480 min Summer	0.226	0.226	3.4	149.4	O K
600 min Summer	0.231	0.231	3.4	153.1	O K
720 min Summer	0.235	0.235	3.4	155.7	O K
960 min Summer	0.239	0.239	3.4	158.2	O K
1440 min Summer	0.238	0.238	3.4	157.7	O K
2160 min Summer	0.228	0.228	3.4	150.8	O K
2880 min Summer	0.215	0.215	3.3	141.7	O K
4320 min Summer	0.180	0.180	3.2	117.9	O K
5760 min Summer	0.153	0.153	3.1	99.3	O K
7200 min Summer	0.132	0.132	3.0	85.2	O K
8640 min Summer	0.116	0.116	2.9	74.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	57.8	26
30 min Summer	18.857	0.0	74.0	40
60 min Summer	11.811	0.0	99.8	68
120 min Summer	7.397	0.0	125.9	126
180 min Summer	5.626	0.0	144.1	184
240 min Summer	4.633	0.0	158.5	242
360 min Summer	3.524	0.0	181.2	320
480 min Summer	2.902	0.0	199.1	384
600 min Summer	2.496	0.0	214.1	450
720 min Summer	2.207	0.0	227.2	518
960 min Summer	1.817	0.0	249.2	658
1440 min Summer	1.380	0.0	282.9	932
2160 min Summer	1.049	0.0	330.8	1344
2880 min Summer	0.863	0.0	362.8	1736
4320 min Summer	0.637	0.0	399.3	2508
5760 min Summer	0.513	0.0	434.0	3224
7200 min Summer	0.434	0.0	458.3	3896
8640 min Summer	0.378	0.0	478.8	4592

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.105	0.105	2.7	67.5	O K
15 min Winter	0.113	0.113	2.8	72.5	O K
30 min Winter	0.139	0.139	3.0	89.7	O K
60 min Winter	0.169	0.169	3.2	110.0	O K
120 min Winter	0.202	0.202	3.3	132.4	O K
180 min Winter	0.221	0.221	3.3	145.5	O K
240 min Winter	0.233	0.233	3.4	154.2	O K
360 min Winter	0.248	0.248	3.4	164.4	O K
480 min Winter	0.255	0.255	3.4	169.4	O K
600 min Winter	0.260	0.260	3.4	172.9	O K
720 min Winter	0.263	0.263	3.4	175.1	O K
960 min Winter	0.264	0.264	3.4	176.4	O K
1440 min Winter	0.258	0.258	3.4	171.8	O K
2160 min Winter	0.238	0.238	3.4	157.9	O K
2880 min Winter	0.216	0.216	3.3	142.1	O K
4320 min Winter	0.165	0.165	3.2	107.6	O K
5760 min Winter	0.129	0.129	3.0	83.4	O K
7200 min Winter	0.107	0.107	2.8	68.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	495.5	5264
15 min Winter	30.107	0.0	65.5	26
30 min Winter	18.857	0.0	83.6	39
60 min Winter	11.811	0.0	112.2	68
120 min Winter	7.397	0.0	141.4	124
180 min Winter	5.626	0.0	161.8	180
240 min Winter	4.633	0.0	177.9	238
360 min Winter	3.524	0.0	203.3	346
480 min Winter	2.902	0.0	223.4	446
600 min Winter	2.496	0.0	240.2	480
720 min Winter	2.207	0.0	254.9	558
960 min Winter	1.817	0.0	279.4	714
1440 min Winter	1.380	0.0	317.0	1016
2160 min Winter	1.049	0.0	370.8	1452
2880 min Winter	0.863	0.0	406.7	1852
4320 min Winter	0.637	0.0	448.0	2600
5760 min Winter	0.513	0.0	486.3	3296
7200 min Winter	0.434	0.0	513.6	3960

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.095	0.095	2.5	60.4	O K
10080 min Winter	0.086	0.086	2.2	54.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	536.7	4664
10080 min Winter	0.337	0.0	555.9	5344

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.180

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.393	4	8	0.393	8	12	0.393

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	624.0	1.500	1192.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0086-3500-1200-3500
Design Head (m)	1.200
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	86
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.5	Kick-Flo®	0.746	2.8
Flush-Flo™	0.367	3.5	Mean Flow over Head Range	-	3.1

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	2.6	1.200	3.5	3.000	5.4	7.000	8.0
0.200	3.3	1.400	3.8	3.500	5.8	7.500	8.3
0.300	3.5	1.600	4.0	4.000	6.1	8.000	8.5
0.400	3.5	1.800	4.2	4.500	6.5	8.500	8.8
0.500	3.4	2.000	4.4	5.000	6.8	9.000	9.0
0.600	3.3	2.200	4.6	5.500	7.1	9.500	9.2
0.800	2.9	2.400	4.8	6.000	7.4		
1.000	3.2	2.600	5.0	6.500	7.7		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.292	0.292	3.5	195.9	O K
30 min Summer	0.340	0.340	3.5	231.1	O K
60 min Summer	0.394	0.394	3.5	271.1	O K
120 min Summer	0.451	0.451	3.5	314.7	O K
180 min Summer	0.484	0.484	3.5	340.7	O K
240 min Summer	0.507	0.507	3.5	358.6	O K
360 min Summer	0.535	0.535	3.5	381.8	O K
480 min Summer	0.552	0.552	3.5	395.4	O K
600 min Summer	0.562	0.562	3.5	403.3	O K
720 min Summer	0.567	0.567	3.5	407.6	O K
960 min Summer	0.568	0.568	3.5	408.5	O K
1440 min Summer	0.563	0.563	3.5	403.7	O K
2160 min Summer	0.546	0.546	3.5	390.1	O K
2880 min Summer	0.525	0.525	3.5	373.1	O K
4320 min Summer	0.459	0.459	3.5	321.3	O K
5760 min Summer	0.400	0.400	3.5	276.1	O K
7200 min Summer	0.348	0.348	3.5	237.2	O K
8640 min Summer	0.303	0.303	3.5	204.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	183.1	26
30 min Summer	53.466	0.0	215.8	41
60 min Summer	31.728	0.0	273.8	70
120 min Summer	18.829	0.0	325.0	130
180 min Summer	13.876	0.0	359.0	188
240 min Summer	11.174	0.0	385.0	248
360 min Summer	8.234	0.0	424.2	366
480 min Summer	6.631	0.0	453.6	484
600 min Summer	5.605	0.0	476.6	602
720 min Summer	4.887	0.0	494.8	722
960 min Summer	3.933	0.0	518.0	916
1440 min Summer	2.896	0.0	517.5	1142
2160 min Summer	2.132	0.0	673.7	1524
2880 min Summer	1.716	0.0	721.9	1936
4320 min Summer	1.226	0.0	769.6	2728
5760 min Summer	0.966	0.0	818.8	3520
7200 min Summer	0.803	0.0	850.2	4256
8640 min Summer	0.690	0.0	876.1	5008

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.264	0.264	3.4	176.1	O K
15 min Winter	0.325	0.325	3.5	219.7	O K
30 min Winter	0.378	0.378	3.5	259.4	O K
60 min Winter	0.438	0.438	3.5	304.6	O K
120 min Winter	0.501	0.501	3.5	354.4	O K
180 min Winter	0.539	0.539	3.5	384.6	O K
240 min Winter	0.565	0.565	3.5	405.8	O K
360 min Winter	0.599	0.599	3.5	434.0	O K
480 min Winter	0.620	0.620	3.5	451.6	O K
600 min Winter	0.634	0.634	3.5	462.9	O K
720 min Winter	0.643	0.643	3.5	470.2	O K
960 min Winter	0.650	0.650	3.5	476.1	O K
1440 min Winter	0.642	0.642	3.5	469.6	O K
2160 min Winter	0.617	0.617	3.5	448.4	O K
2880 min Winter	0.586	0.586	3.5	422.7	O K
4320 min Winter	0.490	0.490	3.5	345.8	O K
5760 min Winter	0.403	0.403	3.5	278.2	O K
7200 min Winter	0.327	0.327	3.5	221.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	897.1	5664
15 min Winter	90.095	0.0	204.4	26
30 min Winter	53.466	0.0	239.2	41
60 min Winter	31.728	0.0	306.8	70
120 min Winter	18.829	0.0	363.8	128
180 min Winter	13.876	0.0	401.5	186
240 min Winter	11.174	0.0	430.1	244
360 min Winter	8.234	0.0	472.4	360
480 min Winter	6.631	0.0	502.6	476
600 min Winter	5.605	0.0	523.6	590
720 min Winter	4.887	0.0	536.0	704
960 min Winter	3.933	0.0	538.9	928
1440 min Winter	2.896	0.0	521.9	1346
2160 min Winter	2.132	0.0	754.1	1668
2880 min Winter	1.716	0.0	807.7	2112
4320 min Winter	1.226	0.0	859.2	2984
5760 min Winter	0.966	0.0	917.2	3752
7200 min Winter	0.803	0.0	952.5	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.265	0.265	3.4	176.7	O K
10080 min Winter	0.215	0.215	3.3	141.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	981.8	5192
10080 min Winter	0.608	0.0	1005.8	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.180

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.393	4	8	0.393	8	12	0.393

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	624.0	1.500	1192.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0086-3500-1200-3500
Design Head (m)	1.200
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	86
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.5	Kick-Flo®	0.746	2.8
Flush-Flo™	0.367	3.5	Mean Flow over Head Range	-	3.1

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	2.6	1.200	3.5	3.000	5.4	7.000	8.0
0.200	3.3	1.400	3.8	3.500	5.8	7.500	8.3
0.300	3.5	1.600	4.0	4.000	6.1	8.000	8.5
0.400	3.5	1.800	4.2	4.500	6.5	8.500	8.8
0.500	3.4	2.000	4.4	5.000	6.8	9.000	9.0
0.600	3.3	2.200	4.6	5.500	7.1	9.500	9.2
0.800	2.9	2.400	4.8	6.000	7.4		
1.000	3.2	2.600	5.0	6.500	7.7		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.570	0.570	3.5	409.8	O K
30 min Summer	0.649	0.649	3.5	475.6	O K
60 min Summer	0.735	0.735	3.5	550.3	O K
120 min Summer	0.828	0.828	3.5	633.2	O K
180 min Summer	0.883	0.883	3.5	684.3	O K
240 min Summer	0.922	0.922	3.5	720.9	O K
360 min Summer	0.974	0.974	3.5	771.4	O K
480 min Summer	1.009	1.009	3.5	805.0	O K
600 min Summer	1.033	1.033	3.5	828.8	O K
720 min Summer	1.050	1.050	3.5	846.1	O K
960 min Summer	1.071	1.071	3.5	867.1	O K
1440 min Summer	1.083	1.083	3.5	879.8	O K
2160 min Summer	1.068	1.068	3.5	864.1	O K
2880 min Summer	1.046	1.046	3.5	841.9	O K
4320 min Summer	0.969	0.969	3.5	766.6	O K
5760 min Summer	0.903	0.903	3.5	703.4	O K
7200 min Summer	0.842	0.842	3.5	645.9	O K
8640 min Summer	0.781	0.781	3.5	590.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	295.1	27
30 min Summer	108.845	0.0	292.5	42
60 min Summer	63.353	0.0	531.8	72
120 min Summer	36.874	0.0	555.3	130
180 min Summer	26.867	0.0	548.5	190
240 min Summer	21.462	0.0	541.4	250
360 min Summer	15.638	0.0	530.8	368
480 min Summer	12.492	0.0	523.8	488
600 min Summer	10.494	0.0	519.0	608
720 min Summer	9.102	0.0	515.6	726
960 min Summer	7.267	0.0	512.5	966
1440 min Summer	5.290	0.0	513.1	1442
2160 min Summer	3.852	0.0	1056.1	2024
2880 min Summer	3.075	0.0	1023.4	2368
4320 min Summer	2.173	0.0	942.4	3116
5760 min Summer	1.698	0.0	1438.6	3928
7200 min Summer	1.402	0.0	1484.2	4760
8640 min Summer	1.200	0.0	1521.9	5616

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.713	0.713	3.5	530.5	O K
15 min Winter	0.630	0.630	3.5	459.5	O K
30 min Winter	0.716	0.716	3.5	533.5	O K
60 min Winter	0.811	0.811	3.5	617.7	O K
120 min Winter	0.912	0.912	3.5	711.2	O K
180 min Winter	0.972	0.972	3.5	769.4	O K
240 min Winter	1.015	1.015	3.5	811.3	O K
360 min Winter	1.074	1.074	3.5	870.0	O K
480 min Winter	1.113	1.113	3.5	909.9	O K
600 min Winter	1.141	1.141	3.5	938.8	O K
720 min Winter	1.161	1.161	3.5	960.3	O K
960 min Winter	1.188	1.188	3.5	988.3	O K
1440 min Winter	1.210	1.210	3.5	1011.4	Flood Risk
2160 min Winter	1.205	1.205	3.5	1006.1	Flood Risk
2880 min Winter	1.179	1.179	3.5	979.2	O K
4320 min Winter	1.088	1.088	3.5	884.7	O K
5760 min Winter	1.004	1.004	3.5	800.3	O K
7200 min Winter	0.921	0.921	3.5	720.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	1553.4	6360
15 min Winter	187.006	0.0	294.6	27
30 min Winter	108.845	0.0	284.9	41
60 min Winter	63.353	0.0	556.9	70
120 min Winter	36.874	0.0	548.6	128
180 min Winter	26.867	0.0	539.6	188
240 min Winter	21.462	0.0	533.7	246
360 min Winter	15.638	0.0	527.3	364
480 min Winter	12.492	0.0	525.1	480
600 min Winter	10.494	0.0	525.9	598
720 min Winter	9.102	0.0	528.9	714
960 min Winter	7.267	0.0	535.0	946
1440 min Winter	5.290	0.0	536.4	1402
2160 min Winter	3.852	0.0	1066.7	2060
2880 min Winter	3.075	0.0	1041.5	2680
4320 min Winter	2.173	0.0	986.2	3328
5760 min Winter	1.698	0.0	1610.7	4264
7200 min Winter	1.402	0.0	1661.1	5184

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.838	0.838	3.5	642.6	O K
10080 min Winter	0.746	0.746	3.5	559.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	1701.3	6056
10080 min Winter	1.051	0.0	1732.4	6968

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.180

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.393	4	8	0.393	8	12	0.393

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	624.0	1.500	1192.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0086-3500-1200-3500
Design Head (m)	1.200
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	86
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.5	Kick-Flo®	0.746	2.8
Flush-Flo™	0.367	3.5	Mean Flow over Head Range	-	3.1

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	2.6	1.200	3.5	3.000	5.4	7.000	8.0
0.200	3.3	1.400	3.8	3.500	5.8	7.500	8.3
0.300	3.5	1.600	4.0	4.000	6.1	8.000	8.5
0.400	3.5	1.800	4.2	4.500	6.5	8.500	8.8
0.500	3.4	2.000	4.4	5.000	6.8	9.000	9.0
0.600	3.3	2.200	4.6	5.500	7.1	9.500	9.2
0.800	2.9	2.400	4.8	6.000	7.4		
1.000	3.2	2.600	5.0	6.500	7.7		

Summary of Results for 1 year Return Period

Half Drain Time : 27 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.147	0.147	93.0	224.1	O K
30 min Summer	0.168	0.168	95.1	257.9	O K
60 min Summer	0.175	0.175	95.8	268.6	O K
120 min Summer	0.167	0.167	95.0	256.0	O K
180 min Summer	0.153	0.153	93.6	233.3	O K
240 min Summer	0.138	0.138	92.2	209.5	O K
360 min Summer	0.110	0.110	89.5	165.6	O K
480 min Summer	0.087	0.087	87.3	129.9	O K
600 min Summer	0.069	0.069	85.5	102.8	O K
720 min Summer	0.056	0.056	84.3	83.6	O K
960 min Summer	0.046	0.046	76.4	67.7	O K
1440 min Summer	0.036	0.036	59.3	53.2	O K
2160 min Summer	0.028	0.028	45.8	41.2	O K
2880 min Summer	0.023	0.023	38.3	34.0	O K
4320 min Summer	0.017	0.017	28.3	25.2	O K
5760 min Summer	0.014	0.014	23.3	20.6	O K
7200 min Summer	0.012	0.012	19.2	17.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	21
30 min Summer	18.857	0.0	31
60 min Summer	11.811	0.0	48
120 min Summer	7.397	0.0	82
180 min Summer	5.626	0.0	116
240 min Summer	4.633	0.0	148
360 min Summer	3.524	0.0	210
480 min Summer	2.902	0.0	270
600 min Summer	2.496	0.0	326
720 min Summer	2.207	0.0	382
960 min Summer	1.817	0.0	496
1440 min Summer	1.380	0.0	738
2160 min Summer	1.049	0.0	1104
2880 min Summer	0.863	0.0	1456
4320 min Summer	0.637	0.0	2176
5760 min Summer	0.513	0.0	2904
7200 min Summer	0.434	0.0	3560

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	0.010	0.010	16.7	14.8	O K
10080 min Summer	0.009	0.009	15.1	13.4	O K
15 min Winter	0.167	0.167	95.0	256.2	O K
30 min Winter	0.191	0.191	97.4	295.7	O K
60 min Winter	0.197	0.197	97.9	305.3	O K
120 min Winter	0.180	0.180	96.3	277.5	O K
180 min Winter	0.155	0.155	93.9	237.4	O K
240 min Winter	0.130	0.130	91.4	198.0	O K
360 min Winter	0.087	0.087	87.3	130.9	O K
480 min Winter	0.057	0.057	84.4	85.2	O K
600 min Winter	0.047	0.047	78.1	69.2	O K
720 min Winter	0.042	0.042	69.6	61.6	O K
960 min Winter	0.035	0.035	57.6	51.2	O K
1440 min Winter	0.027	0.027	44.2	39.2	O K
2160 min Winter	0.020	0.020	33.3	30.2	O K
2880 min Winter	0.017	0.017	27.5	24.8	O K
4320 min Winter	0.013	0.013	20.9	18.4	O K
5760 min Winter	0.010	0.010	16.7	14.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
8640 min Summer	0.378	0.0	4408
10080 min Summer	0.337	0.0	5104
15 min Winter	30.107	0.0	22
30 min Winter	18.857	0.0	32
60 min Winter	11.811	0.0	52
120 min Winter	7.397	0.0	88
180 min Winter	5.626	0.0	124
240 min Winter	4.633	0.0	156
360 min Winter	3.524	0.0	218
480 min Winter	2.902	0.0	268
600 min Winter	2.496	0.0	318
720 min Winter	2.207	0.0	376
960 min Winter	1.817	0.0	496
1440 min Winter	1.380	0.0	740
2160 min Winter	1.049	0.0	1108
2880 min Winter	0.863	0.0	1472
4320 min Winter	0.637	0.0	2188
5760 min Winter	0.513	0.0	2912

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
7200 min Winter	0.009	0.009	14.3	12.6	O K
8640 min Winter	0.008	0.008	12.6	11.1	O K
10080 min Winter	0.007	0.007	11.0	9.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
7200 min Winter	0.434	0.0	3696
8640 min Winter	0.378	0.0	4392
10080 min Winter	0.337	0.0	5080

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.420

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.807	4	8	1.807	8	12	1.807

Model Details

Storage is Online Cover Level (m) 1.500

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.38760 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.38760

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1467.0	1.500	2903.0

Summary of Results for 30 year Return Period

Half Drain Time : 77 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.475	0.475	125.4	789.9	O K
30 min Summer	0.526	0.526	130.5	886.1	O K
60 min Summer	0.548	0.548	132.8	929.7	O K
120 min Summer	0.535	0.535	131.4	904.1	O K
180 min Summer	0.513	0.513	129.2	861.4	O K
240 min Summer	0.489	0.489	126.9	817.1	O K
360 min Summer	0.443	0.443	122.2	731.6	O K
480 min Summer	0.400	0.400	117.9	652.1	O K
600 min Summer	0.359	0.359	113.8	579.6	O K
720 min Summer	0.321	0.321	110.1	513.5	O K
960 min Summer	0.255	0.255	103.6	400.5	O K
1440 min Summer	0.155	0.155	93.8	236.3	O K
2160 min Summer	0.067	0.067	85.4	100.8	O K
2880 min Summer	0.045	0.045	75.6	67.3	O K
4320 min Summer	0.033	0.033	54.3	48.1	O K
5760 min Summer	0.026	0.026	43.3	38.4	O K
7200 min Summer	0.022	0.022	35.8	31.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	23
30 min Summer	53.466	0.0	35
60 min Summer	31.728	0.0	60
120 min Summer	18.829	0.0	92
180 min Summer	13.876	0.0	126
240 min Summer	11.174	0.0	162
360 min Summer	8.234	0.0	228
480 min Summer	6.631	0.0	296
600 min Summer	5.605	0.0	360
720 min Summer	4.887	0.0	422
960 min Summer	3.933	0.0	546
1440 min Summer	2.896	0.0	784
2160 min Summer	2.132	0.0	1124
2880 min Summer	1.716	0.0	1468
4320 min Summer	1.226	0.0	2200
5760 min Summer	0.966	0.0	2928
7200 min Summer	0.803	0.0	3600

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	0.019	0.019	30.8	27.5	O K
10080 min Summer	0.017	0.017	27.5	24.4	O K
15 min Winter	0.530	0.530	130.9	893.8	O K
30 min Winter	0.588	0.588	136.9	1008.4	O K
60 min Winter	0.620	0.620	140.2	1071.2	O K
120 min Winter	0.604	0.604	138.5	1039.9	O K
180 min Winter	0.573	0.573	135.4	978.6	O K
240 min Winter	0.538	0.538	131.8	910.5	O K
360 min Winter	0.468	0.468	124.7	778.2	O K
480 min Winter	0.403	0.403	118.2	658.5	O K
600 min Winter	0.344	0.344	112.3	552.6	O K
720 min Winter	0.290	0.290	107.0	459.8	O K
960 min Winter	0.198	0.198	98.0	307.0	O K
1440 min Winter	0.074	0.074	86.0	110.2	O K
2160 min Winter	0.041	0.041	67.9	60.8	O K
2880 min Winter	0.033	0.033	55.1	48.9	O K
4320 min Winter	0.024	0.024	39.1	35.2	O K
5760 min Winter	0.019	0.019	31.6	28.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
8640 min Summer	0.690	0.0	4352
10080 min Summer	0.608	0.0	5080
15 min Winter	90.095	0.0	24
30 min Winter	53.466	0.0	36
60 min Winter	31.728	0.0	60
120 min Winter	18.829	0.0	98
180 min Winter	13.876	0.0	136
240 min Winter	11.174	0.0	174
360 min Winter	8.234	0.0	246
480 min Winter	6.631	0.0	314
600 min Winter	5.605	0.0	380
720 min Winter	4.887	0.0	446
960 min Winter	3.933	0.0	568
1440 min Winter	2.896	0.0	784
2160 min Winter	2.132	0.0	1108
2880 min Winter	1.716	0.0	1440
4320 min Winter	1.226	0.0	2204
5760 min Winter	0.966	0.0	2928

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
7200 min Winter	0.016	0.016	25.8	23.0	O K
8640 min Winter	0.014	0.014	22.5	20.0	O K
10080 min Winter	0.012	0.012	20.0	17.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
7200 min Winter	0.803	0.0	3664
8640 min Winter	0.690	0.0	4368
10080 min Winter	0.608	0.0	5072

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.420

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.807	4	8	1.807	8	12	1.807

Model Details

Storage is Online Cover Level (m) 1.500

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.38760 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.38760

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1467.0	1.500	2903.0

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

Half Drain Time : 123 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.926	0.926	172.0	1727.1	O K
30 min Summer	1.013	1.013	181.3	1932.3	O K
60 min Summer	1.071	1.071	187.4	2071.3	O K
120 min Summer	1.068	1.068	187.2	2065.4	O K
180 min Summer	1.045	1.045	184.6	2007.7	O K
240 min Summer	1.015	1.015	181.5	1937.4	O K
360 min Summer	0.955	0.955	175.1	1795.2	O K
480 min Summer	0.900	0.900	169.2	1668.6	O K
600 min Summer	0.849	0.849	163.8	1553.5	O K
720 min Summer	0.800	0.800	158.8	1447.6	O K
960 min Summer	0.711	0.711	149.5	1257.8	O K
1440 min Summer	0.561	0.561	134.1	955.2	O K
2160 min Summer	0.390	0.390	116.9	635.3	O K
2880 min Summer	0.264	0.264	104.5	415.8	O K
4320 min Summer	0.090	0.090	87.6	135.4	O K
5760 min Summer	0.045	0.045	75.6	66.9	O K
7200 min Summer	0.038	0.038	62.7	55.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	24
30 min Summer	108.845	0.0	37
60 min Summer	63.353	0.0	64
120 min Summer	36.874	0.0	104
180 min Summer	26.867	0.0	136
240 min Summer	21.462	0.0	170
360 min Summer	15.638	0.0	238
480 min Summer	12.492	0.0	308
600 min Summer	10.494	0.0	374
720 min Summer	9.102	0.0	440
960 min Summer	7.267	0.0	570
1440 min Summer	5.290	0.0	822
2160 min Summer	3.852	0.0	1192
2880 min Summer	3.075	0.0	1540
4320 min Summer	2.173	0.0	2244
5760 min Summer	1.698	0.0	2888
7200 min Summer	1.402	0.0	3624

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	0.032	0.032	53.4	47.5	O K
10080 min Summer	0.028	0.028	46.7	41.6	O K
15 min Winter	1.020	1.020	182.0	1947.2	O K
30 min Winter	1.118	1.118	192.5	2186.7	O K
60 min Winter	1.187	1.187	200.0	2362.2	O K
120 min Winter	1.192	1.192	200.5	2374.6	O K
180 min Winter	1.165	1.165	197.6	2304.7	O K
240 min Winter	1.128	1.128	193.6	2213.1	O K
360 min Winter	1.044	1.044	184.6	2006.6	O K
480 min Winter	0.965	0.965	176.1	1817.6	O K
600 min Winter	0.891	0.891	168.3	1648.0	O K
720 min Winter	0.822	0.822	161.0	1494.2	O K
960 min Winter	0.697	0.697	148.0	1227.2	O K
1440 min Winter	0.494	0.494	127.3	825.2	O K
2160 min Winter	0.275	0.275	105.5	433.6	O K
2880 min Winter	0.127	0.127	91.1	192.1	O K
4320 min Winter	0.042	0.042	69.6	61.7	O K
5760 min Winter	0.033	0.033	54.3	48.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
8640 min Summer	1.200	0.0	4328
10080 min Summer	1.051	0.0	5016
15 min Winter	187.006	0.0	24
30 min Winter	108.845	0.0	37
60 min Winter	63.353	0.0	64
120 min Winter	36.874	0.0	114
180 min Winter	26.867	0.0	144
240 min Winter	21.462	0.0	182
360 min Winter	15.638	0.0	258
480 min Winter	12.492	0.0	330
600 min Winter	10.494	0.0	400
720 min Winter	9.102	0.0	470
960 min Winter	7.267	0.0	604
1440 min Winter	5.290	0.0	858
2160 min Winter	3.852	0.0	1220
2880 min Winter	3.075	0.0	1564
4320 min Winter	2.173	0.0	2196
5760 min Winter	1.698	0.0	2936

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
7200 min Winter	0.027	0.027	45.0	40.1	O K
8640 min Winter	0.024	0.024	39.1	34.8	O K
10080 min Winter	0.021	0.021	34.1	30.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
7200 min Winter	1.402	0.0	3640
8640 min Winter	1.200	0.0	4400
10080 min Winter	1.051	0.0	5152

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.420

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.807	4	8	1.807	8	12	1.807

Model Details

Storage is Online Cover Level (m) 1.500

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.38760 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.38760

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1467.0	1.500	2903.0

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.095	0.095	3.3	95.4	O K
30 min Summer	0.117	0.117	4.0	117.7	O K
60 min Summer	0.142	0.142	4.5	143.9	O K
120 min Summer	0.170	0.170	4.7	172.9	O K
180 min Summer	0.186	0.186	4.7	189.8	O K
240 min Summer	0.196	0.196	4.8	200.7	O K
360 min Summer	0.209	0.209	4.9	213.8	O K
480 min Summer	0.217	0.217	4.9	222.6	O K
600 min Summer	0.223	0.223	4.9	228.8	O K
720 min Summer	0.227	0.227	4.9	233.3	O K
960 min Summer	0.231	0.231	4.9	238.3	O K
1440 min Summer	0.233	0.233	4.9	239.5	O K
2160 min Summer	0.225	0.225	4.9	231.4	O K
2880 min Summer	0.214	0.214	4.9	219.1	O K
4320 min Summer	0.182	0.182	4.7	185.1	O K
5760 min Summer	0.156	0.156	4.6	158.3	O K
7200 min Summer	0.137	0.137	4.4	138.1	O K
8640 min Summer	0.123	0.123	4.2	123.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	79.5	26
30 min Summer	18.857	0.0	102.7	40
60 min Summer	11.811	0.0	142.9	68
120 min Summer	7.397	0.0	181.0	126
180 min Summer	5.626	0.0	207.5	184
240 min Summer	4.633	0.0	228.5	242
360 min Summer	3.524	0.0	261.5	322
480 min Summer	2.902	0.0	287.5	386
600 min Summer	2.496	0.0	309.3	452
720 min Summer	2.207	0.0	328.3	520
960 min Summer	1.817	0.0	359.9	658
1440 min Summer	1.380	0.0	408.1	934
2160 min Summer	1.049	0.0	482.4	1344
2880 min Summer	0.863	0.0	528.9	1736
4320 min Summer	0.637	0.0	580.9	2508
5760 min Summer	0.513	0.0	634.8	3224
7200 min Summer	0.434	0.0	670.1	3896
8640 min Summer	0.378	0.0	699.5	4584

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.113	0.113	3.9	114.2	O K
15 min Winter	0.106	0.106	3.7	106.8	O K
30 min Winter	0.131	0.131	4.4	132.0	O K
60 min Winter	0.159	0.159	4.6	161.9	O K
120 min Winter	0.191	0.191	4.8	195.3	O K
180 min Winter	0.210	0.210	4.9	215.0	O K
240 min Winter	0.222	0.222	4.9	228.2	O K
360 min Winter	0.237	0.237	5.0	244.0	O K
480 min Winter	0.244	0.244	5.0	252.1	O K
600 min Winter	0.250	0.250	5.0	257.8	O K
720 min Winter	0.253	0.253	5.0	261.9	O K
960 min Winter	0.256	0.256	5.0	264.9	O K
1440 min Winter	0.252	0.252	5.0	260.3	O K
2160 min Winter	0.235	0.235	4.9	242.1	O K
2880 min Winter	0.214	0.214	4.9	220.0	O K
4320 min Winter	0.167	0.167	4.6	170.3	O K
5760 min Winter	0.134	0.134	4.4	135.5	O K
7200 min Winter	0.116	0.116	4.0	116.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	723.0	5344
15 min Winter	30.107	0.0	90.5	26
30 min Winter	18.857	0.0	116.6	40
60 min Winter	11.811	0.0	161.1	68
120 min Winter	7.397	0.0	203.7	124
180 min Winter	5.626	0.0	233.4	180
240 min Winter	4.633	0.0	256.9	238
360 min Winter	3.524	0.0	293.8	348
480 min Winter	2.902	0.0	322.9	446
600 min Winter	2.496	0.0	347.4	482
720 min Winter	2.207	0.0	368.5	558
960 min Winter	1.817	0.0	403.8	714
1440 min Winter	1.380	0.0	457.6	1018
2160 min Winter	1.049	0.0	540.9	1452
2880 min Winter	0.863	0.0	593.2	1852
4320 min Winter	0.637	0.0	652.2	2600
5760 min Winter	0.513	0.0	711.5	3288
7200 min Winter	0.434	0.0	751.2	3968

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.103	0.103	3.6	103.9	O K
10080 min Winter	0.094	0.094	3.3	94.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	784.5	4672
10080 min Winter	0.337	0.0	811.5	5352

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.730

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.577	4	8	0.577	8	12	0.577

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	985.0	1.500	1637.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0104-5100-1200-5100
Design Head (m)	1.200
Design Flow (l/s)	5.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	104
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.1	Kick-Flo®	0.749	4.1
Flush-Flo™	0.358	5.1	Mean Flow over Head Range	-	4.5

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	3.5	1.200	5.1	3.000	7.8	7.000	11.7
0.200	4.8	1.400	5.5	3.500	8.4	7.500	12.1
0.300	5.1	1.600	5.8	4.000	9.0	8.000	12.5
0.400	5.1	1.800	6.2	4.500	9.5	8.500	12.8
0.500	5.0	2.000	6.5	5.000	10.0	9.000	13.2
0.600	4.8	2.200	6.8	5.500	10.4	9.500	13.5
0.800	4.2	2.400	7.0	6.000	10.9		
1.000	4.7	2.600	7.3	6.500	11.3		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.277	0.277	5.0	287.3	O K
30 min Summer	0.324	0.324	5.1	339.2	O K
60 min Summer	0.376	0.376	5.1	398.0	O K
120 min Summer	0.432	0.432	5.1	462.4	O K
180 min Summer	0.466	0.466	5.1	501.1	O K
240 min Summer	0.488	0.488	5.1	527.9	O K
360 min Summer	0.518	0.518	5.1	562.8	O K
480 min Summer	0.535	0.535	5.1	583.5	O K
600 min Summer	0.546	0.546	5.1	596.0	O K
720 min Summer	0.551	0.551	5.1	603.0	O K
960 min Summer	0.554	0.554	5.1	605.9	O K
1440 min Summer	0.550	0.550	5.1	601.2	O K
2160 min Summer	0.535	0.535	5.1	583.8	O K
2880 min Summer	0.516	0.516	5.1	560.3	O K
4320 min Summer	0.452	0.452	5.1	485.5	O K
5760 min Summer	0.395	0.395	5.1	419.5	O K
7200 min Summer	0.344	0.344	5.1	362.3	O K
8640 min Summer	0.301	0.301	5.1	313.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	260.3	26
30 min Summer	53.466	0.0	307.4	41
60 min Summer	31.728	0.0	396.7	70
120 min Summer	18.829	0.0	471.1	130
180 min Summer	13.876	0.0	520.4	188
240 min Summer	11.174	0.0	558.0	248
360 min Summer	8.234	0.0	614.5	366
480 min Summer	6.631	0.0	656.4	484
600 min Summer	5.605	0.0	689.1	602
720 min Summer	4.887	0.0	714.8	722
960 min Summer	3.933	0.0	747.7	916
1440 min Summer	2.896	0.0	747.3	1142
2160 min Summer	2.132	0.0	983.5	1524
2880 min Summer	1.716	0.0	1053.3	1936
4320 min Summer	1.226	0.0	1120.5	2728
5760 min Summer	0.966	0.0	1198.8	3520
7200 min Summer	0.803	0.0	1244.5	4256
8640 min Summer	0.690	0.0	1281.9	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.263	0.263	5.0	272.4	O K
15 min Winter	0.309	0.309	5.1	322.3	O K
30 min Winter	0.361	0.361	5.1	380.6	O K
60 min Winter	0.419	0.419	5.1	447.1	O K
120 min Winter	0.482	0.482	5.1	520.5	O K
180 min Winter	0.520	0.520	5.1	565.3	O K
240 min Winter	0.546	0.546	5.1	596.7	O K
360 min Winter	0.581	0.581	5.1	638.8	O K
480 min Winter	0.603	0.603	5.1	665.3	O K
600 min Winter	0.617	0.617	5.1	682.5	O K
720 min Winter	0.626	0.626	5.1	693.7	O K
960 min Winter	0.634	0.634	5.1	703.6	O K
1440 min Winter	0.628	0.628	5.1	696.2	O K
2160 min Winter	0.605	0.605	5.1	668.3	O K
2880 min Winter	0.576	0.576	5.1	632.6	O K
4320 min Winter	0.483	0.483	5.1	521.8	O K
5760 min Winter	0.398	0.398	5.1	423.1	O K
7200 min Winter	0.324	0.324	5.1	340.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	1311.1	5664
15 min Winter	90.095	0.0	291.1	26
30 min Winter	53.466	0.0	341.2	41
60 min Winter	31.728	0.0	444.7	70
120 min Winter	18.829	0.0	527.5	128
180 min Winter	13.876	0.0	581.9	186
240 min Winter	11.174	0.0	623.1	244
360 min Winter	8.234	0.0	683.8	360
480 min Winter	6.631	0.0	726.8	476
600 min Winter	5.605	0.0	757.0	590
720 min Winter	4.887	0.0	775.8	704
960 min Winter	3.933	0.0	782.5	928
1440 min Winter	2.896	0.0	755.7	1344
2160 min Winter	2.132	0.0	1100.7	1668
2880 min Winter	1.716	0.0	1178.0	2116
4320 min Winter	1.226	0.0	1249.7	2984
5760 min Winter	0.966	0.0	1343.1	3760
7200 min Winter	0.803	0.0	1394.6	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.264	0.264	5.0	273.3	O K
10080 min Winter	0.216	0.216	4.9	221.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	1436.8	5192
10080 min Winter	0.608	0.0	1470.7	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.730

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.577	4	8	0.577	8	12	0.577

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	985.0	1.500	1637.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0104-5100-1200-5100
Design Head (m)	1.200
Design Flow (l/s)	5.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	104
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.1	Kick-Flo®	0.749	4.1
Flush-Flo™	0.358	5.1	Mean Flow over Head Range	-	4.5

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	3.5	1.200	5.1	3.000	7.8	7.000	11.7
0.200	4.8	1.400	5.5	3.500	8.4	7.500	12.1
0.300	5.1	1.600	5.8	4.000	9.0	8.000	12.5
0.400	5.1	1.800	6.2	4.500	9.5	8.500	12.8
0.500	5.0	2.000	6.5	5.000	10.0	9.000	13.2
0.600	4.8	2.200	6.8	5.500	10.4	9.500	13.5
0.800	4.2	2.400	7.0	6.000	10.9		
1.000	4.7	2.600	7.3	6.500	11.3		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.550	0.550	5.1	601.0	O K
30 min Summer	0.629	0.629	5.1	697.5	O K
60 min Summer	0.716	0.716	5.1	807.1	O K
120 min Summer	0.810	0.810	5.1	929.3	O K
180 min Summer	0.867	0.867	5.1	1004.7	O K
240 min Summer	0.907	0.907	5.1	1058.8	O K
360 min Summer	0.962	0.962	5.1	1133.7	O K
480 min Summer	0.998	0.998	5.1	1184.0	O K
600 min Summer	1.023	1.023	5.1	1219.6	O K
720 min Summer	1.042	1.042	5.1	1245.6	O K
960 min Summer	1.064	1.064	5.1	1277.9	O K
1440 min Summer	1.079	1.079	5.1	1299.1	O K
2160 min Summer	1.065	1.065	5.1	1279.1	O K
2880 min Summer	1.043	1.043	5.1	1248.4	O K
4320 min Summer	0.966	0.966	5.1	1140.1	O K
5760 min Summer	0.899	0.899	5.1	1048.0	O K
7200 min Summer	0.836	0.836	5.1	963.6	O K
8640 min Summer	0.774	0.774	5.1	881.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	430.1	27
30 min Summer	108.845	0.0	427.7	42
60 min Summer	63.353	0.0	770.7	72
120 min Summer	36.874	0.0	812.1	130
180 min Summer	26.867	0.0	801.2	190
240 min Summer	21.462	0.0	789.9	250
360 min Summer	15.638	0.0	772.9	368
480 min Summer	12.492	0.0	761.4	488
600 min Summer	10.494	0.0	753.2	608
720 min Summer	9.102	0.0	747.3	726
960 min Summer	7.267	0.0	740.4	966
1440 min Summer	5.290	0.0	738.7	1442
2160 min Summer	3.852	0.0	1529.9	2056
2880 min Summer	3.075	0.0	1480.4	2372
4320 min Summer	2.173	0.0	1360.7	3120
5760 min Summer	1.698	0.0	2106.0	3928
7200 min Summer	1.402	0.0	2172.1	4760
8640 min Summer	1.200	0.0	2226.2	5624

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.704	0.704	5.1	792.0	O K
15 min Winter	0.610	0.610	5.1	673.7	O K
30 min Winter	0.697	0.697	5.1	782.4	O K
60 min Winter	0.793	0.793	5.1	906.0	O K
120 min Winter	0.896	0.896	5.1	1043.6	O K
180 min Winter	0.958	0.958	5.1	1129.3	O K
240 min Winter	1.003	1.003	5.1	1191.2	O K
360 min Winter	1.064	1.064	5.1	1278.0	O K
480 min Winter	1.105	1.105	5.1	1337.2	O K
600 min Winter	1.135	1.135	5.1	1380.1	O K
720 min Winter	1.157	1.157	5.1	1412.3	O K
960 min Winter	1.185	1.185	5.1	1454.5	O K
1440 min Winter	1.209	1.209	5.1	1490.6	Flood Risk
2160 min Winter	1.206	1.206	5.1	1485.7	Flood Risk
2880 min Winter	1.181	1.181	5.1	1448.8	O K
4320 min Winter	1.089	1.089	5.1	1313.1	O K
5760 min Winter	1.003	1.003	5.1	1190.8	O K
7200 min Winter	0.918	0.918	5.1	1074.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	2270.9	6360
15 min Winter	187.006	0.0	430.4	27
30 min Winter	108.845	0.0	418.9	41
60 min Winter	63.353	0.0	814.0	70
120 min Winter	36.874	0.0	801.4	128
180 min Winter	26.867	0.0	787.1	188
240 min Winter	21.462	0.0	777.5	246
360 min Winter	15.638	0.0	766.8	364
480 min Winter	12.492	0.0	762.3	480
600 min Winter	10.494	0.0	761.8	598
720 min Winter	9.102	0.0	764.5	714
960 min Winter	7.267	0.0	772.9	946
1440 min Winter	5.290	0.0	774.8	1402
2160 min Winter	3.852	0.0	1547.0	2064
2880 min Winter	3.075	0.0	1508.5	2684
4320 min Winter	2.173	0.0	1424.5	3332
5760 min Winter	1.698	0.0	2357.5	4264
7200 min Winter	1.402	0.0	2430.1	5184

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.833	0.833	5.1	959.6	O K
10080 min Winter	0.737	0.737	5.1	834.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	2486.5	6064
10080 min Winter	1.051	0.0	2530.0	6960

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.730

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.577	4	8	0.577	8	12	0.577

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	985.0	1.500	1637.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0104-5100-1200-5100
Design Head (m)	1.200
Design Flow (l/s)	5.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	104
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.1	Kick-Flo®	0.749	4.1
Flush-Flo™	0.358	5.1	Mean Flow over Head Range	-	4.5

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	3.5	1.200	5.1	3.000	7.8	7.000	11.7
0.200	4.8	1.400	5.5	3.500	8.4	7.500	12.1
0.300	5.1	1.600	5.8	4.000	9.0	8.000	12.5
0.400	5.1	1.800	6.2	4.500	9.5	8.500	12.8
0.500	5.0	2.000	6.5	5.000	10.0	9.000	13.2
0.600	4.8	2.200	6.8	5.500	10.4	9.500	13.5
0.800	4.2	2.400	7.0	6.000	10.9		
1.000	4.7	2.600	7.3	6.500	11.3		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.092	0.092	4.9	232.7	O K
30 min Summer	0.113	0.113	6.8	288.3	O K
60 min Summer	0.138	0.138	9.0	353.4	O K
120 min Summer	0.165	0.165	10.8	424.7	O K
180 min Summer	0.181	0.181	11.4	465.7	O K
240 min Summer	0.191	0.191	11.5	493.6	O K
360 min Summer	0.204	0.204	11.7	528.4	O K
480 min Summer	0.214	0.214	11.8	552.9	O K
600 min Summer	0.220	0.220	11.8	571.2	O K
720 min Summer	0.226	0.226	11.9	585.1	O K
960 min Summer	0.232	0.232	11.9	603.1	O K
1440 min Summer	0.237	0.237	11.9	616.2	O K
2160 min Summer	0.234	0.234	11.9	608.1	O K
2880 min Summer	0.226	0.226	11.9	586.1	O K
4320 min Summer	0.199	0.199	11.6	513.0	O K
5760 min Summer	0.177	0.177	11.3	454.7	O K
7200 min Summer	0.162	0.162	10.6	415.8	O K
8640 min Summer	0.150	0.150	9.8	385.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.107	0.0	159.6	26
30 min Summer	18.857	0.0	211.9	41
60 min Summer	11.811	0.0	321.4	68
120 min Summer	7.397	0.0	411.9	126
180 min Summer	5.626	0.0	474.9	184
240 min Summer	4.633	0.0	524.7	242
360 min Summer	3.524	0.0	602.8	322
480 min Summer	2.902	0.0	664.2	386
600 min Summer	2.496	0.0	715.4	452
720 min Summer	2.207	0.0	759.5	520
960 min Summer	1.817	0.0	832.8	658
1440 min Summer	1.380	0.0	942.3	934
2160 min Summer	1.049	0.0	1146.0	1344
2880 min Summer	0.863	0.0	1255.5	1736
4320 min Summer	0.637	0.0	1372.0	2476
5760 min Summer	0.513	0.0	1522.6	3184
7200 min Summer	0.434	0.0	1605.7	3896
8640 min Summer	0.378	0.0	1673.0	4664

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.141	0.141	9.2	361.4	O K
15 min Winter	0.102	0.102	5.8	260.4	O K
30 min Winter	0.126	0.126	8.0	322.7	O K
60 min Winter	0.154	0.154	10.1	396.0	O K
120 min Winter	0.185	0.185	11.4	477.6	O K
180 min Winter	0.204	0.204	11.7	526.9	O K
240 min Winter	0.216	0.216	11.8	560.6	O K
360 min Winter	0.232	0.232	11.9	602.6	O K
480 min Winter	0.241	0.241	12.0	625.8	O K
600 min Winter	0.247	0.247	12.0	642.8	O K
720 min Winter	0.252	0.252	12.0	655.8	O K
960 min Winter	0.257	0.257	12.1	669.1	O K
1440 min Winter	0.256	0.256	12.1	668.3	O K
2160 min Winter	0.244	0.244	12.0	635.9	O K
2880 min Winter	0.228	0.228	11.9	591.0	O K
4320 min Winter	0.187	0.187	11.5	482.0	O K
5760 min Winter	0.162	0.162	10.6	414.7	O K
7200 min Winter	0.145	0.145	9.4	370.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.337	0.0	1723.6	5352
15 min Winter	30.107	0.0	184.4	26
30 min Winter	18.857	0.0	243.7	40
60 min Winter	11.811	0.0	364.6	68
120 min Winter	7.397	0.0	466.1	124
180 min Winter	5.626	0.0	536.7	180
240 min Winter	4.633	0.0	592.4	238
360 min Winter	3.524	0.0	679.8	348
480 min Winter	2.902	0.0	748.5	446
600 min Winter	2.496	0.0	805.8	482
720 min Winter	2.207	0.0	855.2	558
960 min Winter	1.817	0.0	937.0	714
1440 min Winter	1.380	0.0	1058.9	1018
2160 min Winter	1.049	0.0	1287.0	1452
2880 min Winter	0.863	0.0	1410.3	1852
4320 min Winter	0.637	0.0	1543.4	2596
5760 min Winter	0.513	0.0	1707.8	3288
7200 min Winter	0.434	0.0	1801.5	4032

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.133	0.133	8.5	338.9	O K
10080 min Winter	0.123	0.123	7.7	315.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.378	0.0	1878.1	4752
10080 min Winter	0.337	0.0	1937.1	5448

Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 4.180

Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)
0	4	1.393	4	8	1.393	8	12	1.393

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2501.0	1.500	3870.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0157-1230-1200-1230
Design Head (m)	1.200
Design Flow (l/s)	12.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	157
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	12.3	Kick-Flo®	0.791	10.1
Flush-Flo™	0.360	12.3	Mean Flow over Head Range	-	10.6

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	5.6	1.200	12.3	3.000	19.0	7.000	28.5
0.200	11.6	1.400	13.2	3.500	20.5	7.500	29.5
0.300	12.2	1.600	14.1	4.000	21.8	8.000	30.4
0.400	12.3	1.800	14.9	4.500	23.1	8.500	31.4
0.500	12.1	2.000	15.7	5.000	24.3	9.000	32.2
0.600	11.8	2.200	16.4	5.500	25.4	9.500	33.1
0.800	10.2	2.400	17.1	6.000	26.5		
1.000	11.3	2.600	17.8	6.500	27.5		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.266	0.266	12.1	695.3	O K
30 min Summer	0.312	0.312	12.3	820.7	O K
60 min Summer	0.363	0.363	12.3	963.8	O K
120 min Summer	0.419	0.419	12.3	1121.5	O K
180 min Summer	0.453	0.453	12.3	1217.2	O K
240 min Summer	0.476	0.476	12.3	1284.0	O K
360 min Summer	0.506	0.506	12.3	1372.2	O K
480 min Summer	0.524	0.524	12.3	1426.2	O K
600 min Summer	0.536	0.536	12.3	1459.9	O K
720 min Summer	0.543	0.543	12.3	1480.0	O K
960 min Summer	0.547	0.547	12.3	1493.4	O K
1440 min Summer	0.547	0.547	12.3	1494.3	O K
2160 min Summer	0.538	0.538	12.3	1465.9	O K
2880 min Summer	0.522	0.522	12.3	1418.3	O K
4320 min Summer	0.463	0.463	12.3	1246.2	O K
5760 min Summer	0.408	0.408	12.3	1089.4	O K
7200 min Summer	0.359	0.359	12.3	951.9	O K
8640 min Summer	0.317	0.317	12.3	833.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	90.095	0.0	579.8	26
30 min Summer	53.466	0.0	690.3	41
60 min Summer	31.728	0.0	926.2	70
120 min Summer	18.829	0.0	1102.4	130
180 min Summer	13.876	0.0	1218.4	188
240 min Summer	11.174	0.0	1306.5	248
360 min Summer	8.234	0.0	1438.0	366
480 min Summer	6.631	0.0	1534.8	484
600 min Summer	5.605	0.0	1609.7	602
720 min Summer	4.887	0.0	1668.6	722
960 min Summer	3.933	0.0	1746.9	912
1440 min Summer	2.896	0.0	1765.9	1140
2160 min Summer	2.132	0.0	2346.7	1524
2880 min Summer	1.716	0.0	2509.2	1936
4320 min Summer	1.226	0.0	2655.5	2728
5760 min Summer	0.966	0.0	2884.2	3520
7200 min Summer	0.803	0.0	2992.0	4256
8640 min Summer	0.690	0.0	3077.9	5008

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.281	0.281	12.2	734.6	O K
15 min Winter	0.297	0.297	12.2	779.7	O K
30 min Winter	0.348	0.348	12.3	920.8	O K
60 min Winter	0.405	0.405	12.3	1082.3	O K
120 min Winter	0.468	0.468	12.3	1261.7	O K
180 min Winter	0.506	0.506	12.3	1371.5	O K
240 min Winter	0.532	0.532	12.3	1449.3	O K
360 min Winter	0.567	0.567	12.3	1554.0	O K
480 min Winter	0.590	0.590	12.3	1620.7	O K
600 min Winter	0.604	0.604	12.3	1665.1	O K
720 min Winter	0.614	0.614	12.3	1694.5	O K
960 min Winter	0.624	0.624	12.3	1723.1	O K
1440 min Winter	0.621	0.621	12.3	1714.4	O K
2160 min Winter	0.604	0.604	12.3	1662.8	O K
2880 min Winter	0.578	0.578	12.3	1587.2	O K
4320 min Winter	0.492	0.492	12.3	1332.1	O K
5760 min Winter	0.411	0.411	12.3	1097.3	O K
7200 min Winter	0.339	0.339	12.3	896.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	3140.2	5664
15 min Winter	90.095	0.0	651.9	26
30 min Winter	53.466	0.0	770.6	41
60 min Winter	31.728	0.0	1040.2	70
120 min Winter	18.829	0.0	1235.6	128
180 min Winter	13.876	0.0	1363.4	186
240 min Winter	11.174	0.0	1459.7	244
360 min Winter	8.234	0.0	1600.8	360
480 min Winter	6.631	0.0	1700.7	476
600 min Winter	5.605	0.0	1773.1	590
720 min Winter	4.887	0.0	1823.1	704
960 min Winter	3.933	0.0	1863.3	926
1440 min Winter	2.896	0.0	1798.8	1338
2160 min Winter	2.132	0.0	2626.1	1664
2880 min Winter	1.716	0.0	2804.9	2112
4320 min Winter	1.226	0.0	2958.3	2984
5760 min Winter	0.966	0.0	3232.4	3760
7200 min Winter	0.803	0.0	3354.5	4536

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.280	0.280	12.2	733.8	O K
10080 min Winter	0.234	0.234	11.9	606.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	0.690	0.0	3452.3	5192
10080 min Winter	0.608	0.0	3525.8	5856

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 4.180

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.393	4	8	1.393	8	12	1.393

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2501.0	1.500	3870.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0157-1230-1200-1230
Design Head (m)	1.200
Design Flow (l/s)	12.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	157
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	12.3	Kick-Flo®	0.791	10.1
Flush-Flo™	0.360	12.3	Mean Flow over Head Range	-	10.6

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	5.6	1.200	12.3	3.000	19.0	7.000	28.5
0.200	11.6	1.400	13.2	3.500	20.5	7.500	29.5
0.300	12.2	1.600	14.1	4.000	21.8	8.000	30.4
0.400	12.3	1.800	14.9	4.500	23.1	8.500	31.4
0.500	12.1	2.000	15.7	5.000	24.3	9.000	32.2
0.600	11.8	2.200	16.4	5.500	25.4	9.500	33.1
0.800	10.2	2.400	17.1	6.000	26.5		
1.000	11.3	2.600	17.8	6.500	27.5		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.533	0.533	12.3	1452.6	O K
30 min Summer	0.611	0.611	12.3	1686.1	O K
60 min Summer	0.698	0.698	12.3	1951.3	O K
120 min Summer	0.792	0.792	12.3	2248.0	O K
180 min Summer	0.850	0.850	12.3	2432.9	O K
240 min Summer	0.891	0.891	12.3	2566.0	O K
360 min Summer	0.947	0.947	12.3	2750.9	O K
480 min Summer	0.984	0.984	12.3	2875.9	O K
600 min Summer	1.011	1.011	12.3	2965.5	O K
720 min Summer	1.030	1.030	12.3	3031.6	O K
960 min Summer	1.055	1.055	12.3	3115.7	O K
1440 min Summer	1.073	1.073	12.3	3177.7	O K
2160 min Summer	1.062	1.062	12.3	3142.9	O K
2880 min Summer	1.044	1.044	12.3	3078.4	O K
4320 min Summer	0.970	0.970	12.3	2827.7	O K
5760 min Summer	0.903	0.903	12.3	2606.5	O K
7200 min Summer	0.839	0.839	12.3	2398.7	O K
8640 min Summer	0.772	0.772	12.3	2183.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	187.006	0.0	1037.3	27
30 min Summer	108.845	0.0	1037.7	42
60 min Summer	63.353	0.0	1813.1	72
120 min Summer	36.874	0.0	1978.1	130
180 min Summer	26.867	0.0	1963.5	190
240 min Summer	21.462	0.0	1933.5	250
360 min Summer	15.638	0.0	1886.1	368
480 min Summer	12.492	0.0	1852.4	488
600 min Summer	10.494	0.0	1826.7	608
720 min Summer	9.102	0.0	1806.2	726
960 min Summer	7.267	0.0	1774.6	966
1440 min Summer	5.290	0.0	1740.2	1442
2160 min Summer	3.852	0.0	3668.1	2056
2880 min Summer	3.075	0.0	3538.2	2376
4320 min Summer	2.173	0.0	3235.4	3120
5760 min Summer	1.698	0.0	5066.3	3928
7200 min Summer	1.402	0.0	5221.4	4768
8640 min Summer	1.200	0.0	5347.4	5544

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	0.705	0.705	12.3	1974.4	O K
15 min Winter	0.592	0.592	12.3	1628.3	O K
30 min Winter	0.678	0.678	12.3	1890.9	O K
60 min Winter	0.774	0.774	12.3	2189.9	O K
120 min Winter	0.878	0.878	12.3	2524.8	O K
180 min Winter	0.941	0.941	12.3	2733.6	O K
240 min Winter	0.987	0.987	12.3	2885.0	O K
360 min Winter	1.049	1.049	12.3	3097.8	O K
480 min Winter	1.092	1.092	12.3	3243.7	O K
600 min Winter	1.122	1.122	12.3	3350.3	O K
720 min Winter	1.145	1.145	12.3	3430.7	O K
960 min Winter	1.175	1.175	12.3	3537.7	O K
1440 min Winter	1.203	1.203	12.3	3634.0	Flood Risk
2160 min Winter	1.203	1.203	12.3	3634.1	Flood Risk
2880 min Winter	1.180	1.180	12.3	3554.9	O K
4320 min Winter	1.090	1.090	12.3	3239.5	O K
5760 min Winter	1.005	1.005	12.3	2948.2	O K
7200 min Winter	0.921	0.921	12.3	2664.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.051	0.0	5445.4	6352
15 min Winter	187.006	0.0	1042.6	27
30 min Winter	108.845	0.0	1026.8	41
60 min Winter	63.353	0.0	1957.3	70
120 min Winter	36.874	0.0	1965.9	128
180 min Winter	26.867	0.0	1928.0	188
240 min Winter	21.462	0.0	1901.1	246
360 min Winter	15.638	0.0	1867.8	364
480 min Winter	12.492	0.0	1848.6	480
600 min Winter	10.494	0.0	1837.3	598
720 min Winter	9.102	0.0	1831.8	714
960 min Winter	7.267	0.0	1834.5	946
1440 min Winter	5.290	0.0	1833.9	1402
2160 min Winter	3.852	0.0	3716.2	2064
2880 min Winter	3.075	0.0	3612.0	2684
4320 min Winter	2.173	0.0	3377.4	3332
5760 min Winter	1.698	0.0	5669.3	4264
7200 min Winter	1.402	0.0	5836.5	5192

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	0.834	0.834	12.3	2380.1	O K
10080 min Winter	0.732	0.732	12.3	2057.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.200	0.0	5964.0	6064
10080 min Winter	1.051	0.0	6064.9	6864

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 457650 224000 SP 57650 24000
C (1km)	-0.023
D1 (1km)	0.325
D2 (1km)	0.323
D3 (1km)	0.249
E (1km)	0.292
F (1km)	2.469
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 4.180

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.393	4	8	1.393	8	12	1.393

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2501.0	1.500	3870.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0157-1230-1200-1230
Design Head (m)	1.200
Design Flow (l/s)	12.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	157
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	12.3	Kick-Flo®	0.791	10.1
Flush-Flo™	0.360	12.3	Mean Flow over Head Range	-	10.6

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	5.6	1.200	12.3	3.000	19.0	7.000	28.5
0.200	11.6	1.400	13.2	3.500	20.5	7.500	29.5
0.300	12.2	1.600	14.1	4.000	21.8	8.000	30.4
0.400	12.3	1.800	14.9	4.500	23.1	8.500	31.4
0.500	12.1	2.000	15.7	5.000	24.3	9.000	32.2
0.600	11.8	2.200	16.4	5.500	25.4	9.500	33.1
0.800	10.2	2.400	17.1	6.000	26.5		
1.000	11.3	2.600	17.8	6.500	27.5		