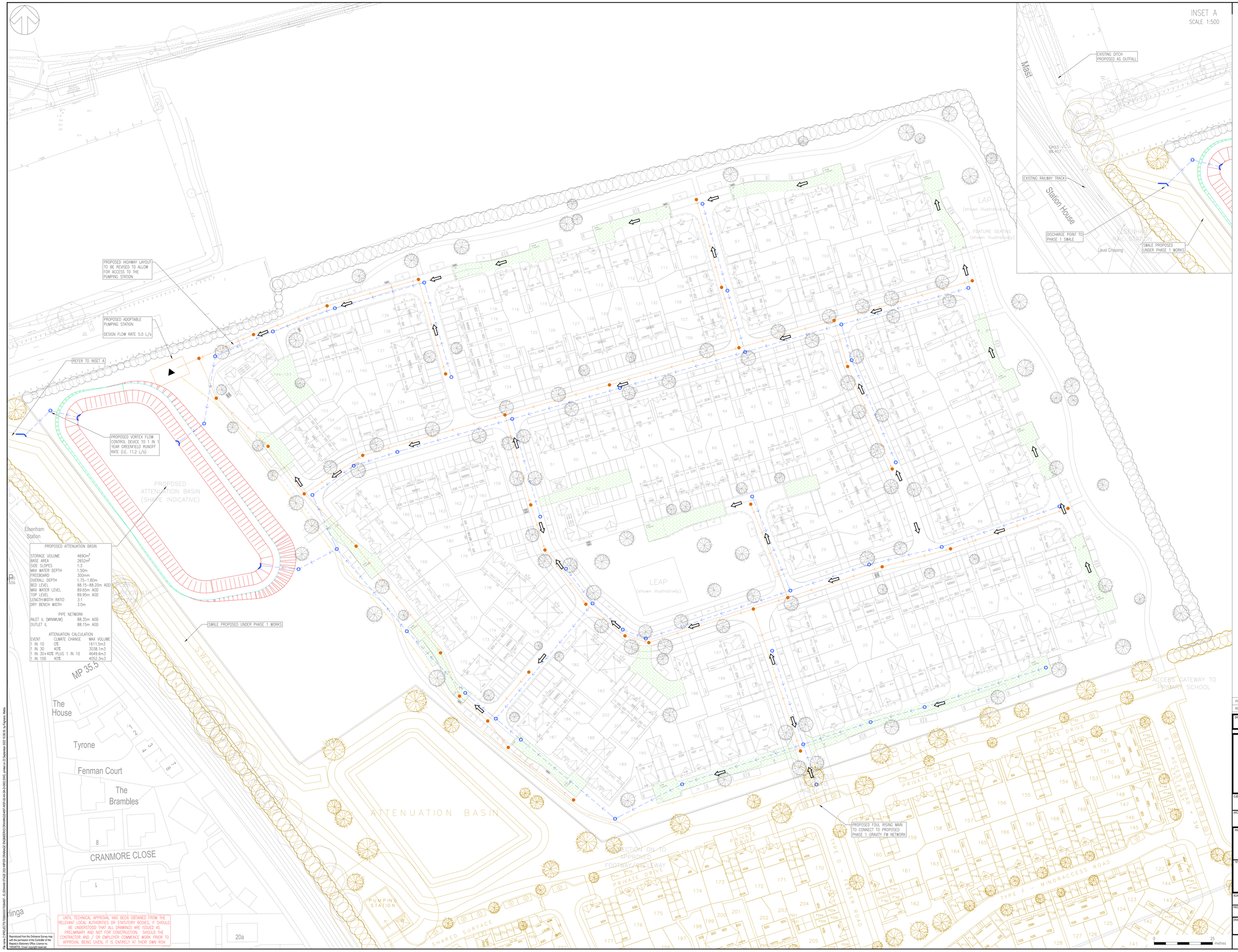

DO NOT SCALE

KEY:

- PHASE 1 ARCHITECT LAYOUT
- PHASE 2 ARCHITECT LAYOUT
- EXCEEDANCE FLOW PATH
- PROPOSED SURFACE WATER SEWER
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL WATER RISING MAIN
- PROPOSED FOUL WATER PUMPING STATION
- PROPOSED LINED PERMEABLE PAVEMENT

NOTES:

1. SITE LAYOUT BASED ON PEGASUS GROUP DRAWING "P22-2073_DE_001_A_01 PH2 TESTING LAYOUT" DATED 17/08/2022.
2. TOPOGRAPHICAL SURVEY BASED ON DWG "31288BWLS-01-17C" PROVIDED BY BLOOR HOMES.
3. DRAWING SHOWN FOR INFORMATION ONLY, NOT FOR CONSTRUCTION/PRICING/TENDER.
4. THIS DRAWINGS MUST BE READ IN CONJUNCTION WITH THE FLOOD RISK ASSESSMENT PRODUCED BY WSP IN SEPTEMBER 2022, DOCUMENT REFERENCE 4697-WSP-00-XX-RP-DR-0001 REVISION 1.0.
5. THE DRAINAGE STRATEGY SHOWN IS SUBJECT TO DETAIL DESIGN.
6. ONLY SEWER MAINS ARE SHOWN.
7. ALL SEWER MAINS TO BE DESIGNED TO ADOPTABLE STANDARDS.
8. FOUL PUMPING STATION TO BE DESIGNED TO ADOPTABLE STANDARDS. PROPOSED DESIGN PUMPING FLOW 5.0 L/s. DISCHARGE POINT TO BE LOCATED WITHIN PROPOSED PHASE 1 GRAVITY NETWORK. PHASE 1 NETWORK TO DISCHARGE INTO EXISTING THAMES WATER FOUL NETWORK.
9. LIAISON WITH THAMES WATER ONGOING TO CONFIRM AVAILABLE CAPACITY WITHIN THEIR NETWORK.
10. PROPOSED PERMEABLE PAVEMENT TO BE LINED AND TO DISCHARGE VIA PERFORATED PIPE TO THE PROPOSED SW SYSTEM.
11. PROPOSED ATTENUATION BASIN SHAPE IS INDICATIVE, SUBJECT TO DETAIL DESIGN AND INPUT FROM OTHER DISCIPLINES.
12. EASEMENTS REQUIRED WHERE SEWER MAINS ARE NOT RUNNING UNDER PUBLIC HIGHWAY.
13. LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE. DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	23/09/2022	MSF	FIRST ISSUE	MSF	JG

DRAWING STATUS: S2 - FOR INFORMATION

wsp
62-64 Hills Road, Cambridge, CB2 1LA, UK
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wsp.com

CLIENT: BLOOR HOMES

ARCHITECT: PEGASUS GROUP

PROJECT: ELSENHAM PHASE 2

TITLE: FLOOD RISK ASSESSMENT APPENDIX G PROPOSED DRAINAGE STRATEGY

SCALE @ A0	CHECKED:	APPROVED:
1:500	MSF	JG
PROJECT No: 70084697	DESIGNED: MSF	DRAWN: MSF
		DATE: September 22

DRAWING No: 4697-WSP-00-XX-SK-D-0902 REV: P01

Appendix H

MICRODRAINAGE CALCULATIONS

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	88.622	0.472	11.2	1314.8	O K
30 min Summer	88.753	0.603	11.2	1699.4	O K
60 min Summer	88.878	0.728	11.2	2078.2	O K
120 min Summer	89.048	0.898	11.2	2609.1	O K
180 min Summer	89.143	0.993	11.2	2911.8	O K
240 min Summer	89.203	1.053	11.2	3107.7	O K
360 min Summer	89.273	1.123	11.2	3337.0	O K
480 min Summer	89.310	1.160	11.2	3460.5	O K
600 min Summer	89.331	1.181	11.2	3531.1	O K
720 min Summer	89.344	1.194	11.2	3571.5	O K
960 min Summer	89.351	1.201	11.2	3597.4	O K
1440 min Summer	89.339	1.189	11.2	3556.5	O K
2160 min Summer	89.295	1.145	11.2	3411.2	O K
2880 min Summer	89.246	1.096	11.2	3247.5	O K
4320 min Summer	89.175	1.025	11.2	3016.4	O K
5760 min Summer	89.123	0.973	11.2	2846.7	O K
15 min Winter	88.677	0.527	11.2	1473.7	O K
30 min Winter	88.821	0.671	11.2	1905.4	O K
60 min Winter	88.960	0.810	11.2	2331.3	O K
120 min Winter	89.148	0.998	11.2	2930.2	O K
180 min Winter	89.253	1.103	11.2	3270.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	140.112	0.0	920.3	27
30 min Summer	90.720	0.0	950.1	42
60 min Summer	55.734	0.0	1811.0	72
120 min Summer	35.245	0.0	1834.1	132
180 min Summer	26.399	0.0	1756.8	190
240 min Summer	21.284	0.0	1707.6	250
360 min Summer	15.461	0.0	1655.3	370
480 min Summer	12.203	0.0	1626.6	490
600 min Summer	10.108	0.0	1607.0	608
720 min Summer	8.645	0.0	1591.9	728
960 min Summer	6.724	0.0	1568.0	966
1440 min Summer	4.698	0.0	1531.1	1444
2160 min Summer	3.279	0.0	3250.0	2160
2880 min Summer	2.549	0.0	3126.7	2636
4320 min Summer	1.809	0.0	2872.5	3340
5760 min Summer	1.433	0.0	5143.0	4144
15 min Winter	140.112	0.0	941.6	27
30 min Winter	90.720	0.0	949.5	41
60 min Winter	55.734	0.0	1862.3	70
120 min Winter	35.245	0.0	1766.1	130
180 min Winter	26.399	0.0	1696.0	188

. . .

Date 23/09/2022 | Designed by MSF
File 4697-WSP-00-XX-MD- | Checked by JG
XP Solutions | Source Control 2019.1

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
240 min Winter	89.320	1.170	11.2	3491.4	O K
360 min Winter	89.398	1.248	11.2	3753.4	O K
480 min Winter	89.440	1.290	11.2	3897.4	O K
600 min Winter	89.465	1.315	11.2	3982.0	O K
720 min Winter	89.480	1.330	11.2	4032.7	O K
960 min Winter	89.491	1.341	11.2	4072.6	O K
1440 min Winter	89.484	1.334	11.2	4048.6	O K
2160 min Winter	89.446	1.296	11.2	3918.4	O K
2880 min Winter	89.400	1.250	11.2	3760.2	O K
4320 min Winter	89.313	1.163	11.2	3468.0	O K
5760 min Winter	89.250	1.100	11.2	3259.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	21.284	0.0	1662.9	246
360 min Winter	15.461	0.0	1637.5	364
480 min Winter	12.203	0.0	1631.9	482
600 min Winter	10.108	0.0	1633.2	600
720 min Winter	8.645	0.0	1637.2	716
960 min Winter	6.724	0.0	1636.6	950
1440 min Winter	4.698	0.0	1611.4	1414
2160 min Winter	3.279	0.0	3255.4	2092
2880 min Winter	2.549	0.0	3152.5	2744
4320 min Winter	1.809	0.0	2963.8	3504
5760 min Winter	1.433	0.0	5736.8	4392

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 553575 226990 TL 53575 26990
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	5760
Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.049

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.683	4	8	1.683	8	12	1.683

Model Details

Storage is Online Cover Level (m) 89.950

Tank or Pond Structure

Invert Level (m) 88.150

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2652.0	1.800	3729.4

Hydro-Brake® Optimum Outflow Control

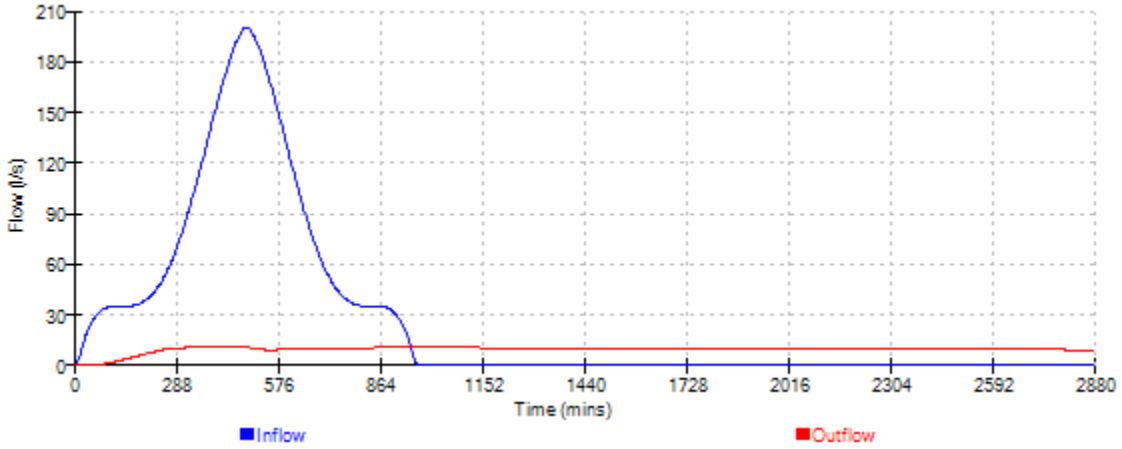
Unit Reference	MD-SHE-0146-1120-1500-1120
Design Head (m)	1.500
Design Flow (l/s)	11.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	146
Invert Level (m)	88.150
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

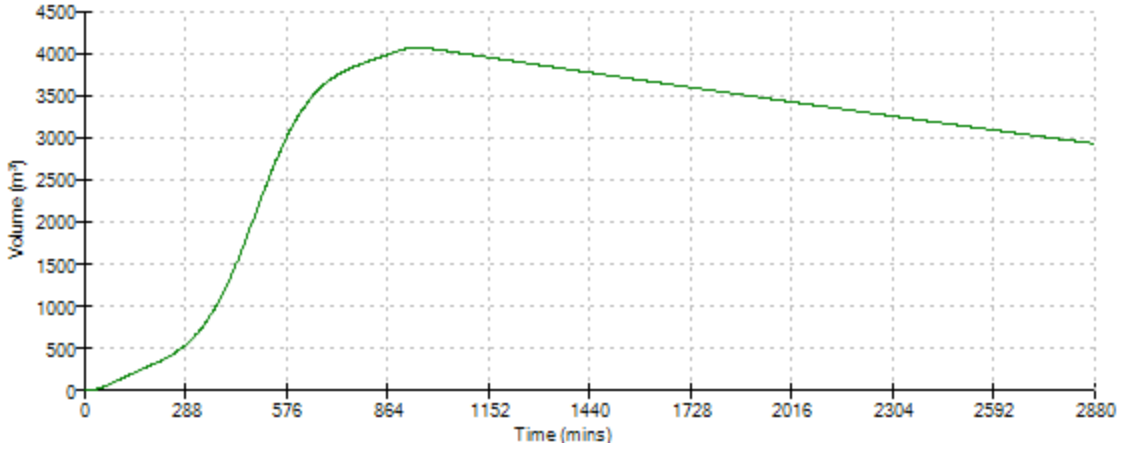
Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	11.2	Kick-Flo®	0.939	9.0
Flush-Flo™	0.440	11.2	Mean Flow over Head Range	-	9.7

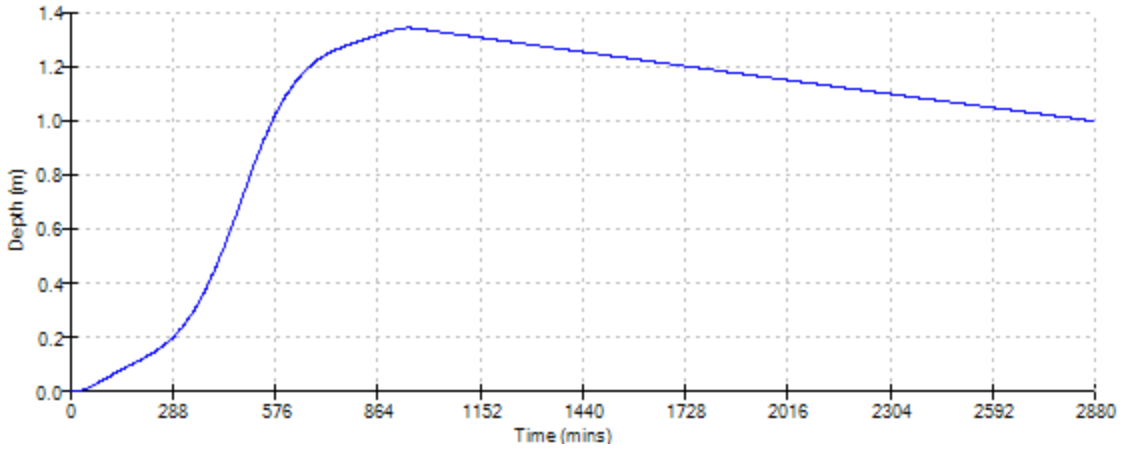
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	1.200	10.1	3.000	15.5	7.000	23.3
0.200	10.1	1.400	10.8	3.500	16.7	7.500	24.1
0.300	10.9	1.600	11.5	4.000	17.8	8.000	24.9
0.400	11.2	1.800	12.2	4.500	18.9	8.500	25.6
0.500	11.2	2.000	12.8	5.000	19.8	9.000	26.3
0.600	11.0	2.200	13.4	5.500	20.8	9.500	27.0
0.800	10.3	2.400	14.0	6.000	21.7		
1.000	9.3	2.600	14.5	6.500	22.5		

Event: 960 min Winter







Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	88.520	0.370	11.1	1020.2	O K
30 min Summer	88.619	0.469	11.2	1306.3	O K
60 min Summer	88.714	0.564	11.2	1585.8	O K
120 min Summer	88.853	0.703	11.2	2002.8	O K
180 min Summer	88.926	0.776	11.2	2227.1	O K
240 min Summer	88.971	0.821	11.2	2367.2	O K
360 min Summer	89.021	0.871	11.2	2524.2	O K
480 min Summer	89.047	0.897	11.2	2605.0	O K
600 min Summer	89.060	0.910	11.2	2648.7	O K
720 min Summer	89.067	0.917	11.2	2670.5	O K
960 min Summer	89.069	0.919	11.2	2674.5	O K
1440 min Summer	89.052	0.902	11.2	2621.8	O K
2160 min Summer	89.010	0.860	11.2	2487.7	O K
2880 min Summer	88.976	0.826	11.2	2382.2	O K
4320 min Summer	88.929	0.779	11.2	2237.9	O K
5760 min Summer	88.894	0.744	11.2	2129.9	O K
15 min Winter	88.563	0.413	11.2	1143.6	O K
30 min Winter	88.674	0.524	11.2	1464.9	O K
60 min Winter	88.779	0.629	11.2	1779.4	O K
120 min Winter	88.933	0.783	11.2	2249.6	O K
180 min Winter	89.015	0.865	11.2	2504.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	108.920	0.0	794.9	27
30 min Summer	69.916	0.0	916.6	41
60 min Summer	42.700	0.0	1473.9	72
120 min Summer	27.230	0.0	1783.4	130
180 min Summer	20.379	0.0	1842.3	190
240 min Summer	16.398	0.0	1836.0	250
360 min Summer	11.872	0.0	1801.7	370
480 min Summer	9.356	0.0	1765.8	488
600 min Summer	7.748	0.0	1733.3	608
720 min Summer	6.628	0.0	1704.6	728
960 min Summer	5.163	0.0	1656.2	966
1440 min Summer	3.635	0.0	1575.7	1442
2160 min Summer	2.574	0.0	3254.5	1972
2880 min Summer	2.028	0.0	3246.8	2280
4320 min Summer	1.472	0.0	3034.6	3028
5760 min Summer	1.187	0.0	4274.9	3816
15 min Winter	108.920	0.0	862.2	27
30 min Winter	69.916	0.0	937.9	41
60 min Winter	42.700	0.0	1628.7	70
120 min Winter	27.230	0.0	1851.5	128
180 min Winter	20.379	0.0	1837.9	188

Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
240 min Winter	89.066	0.916	11.2	2666.1	O K
360 min Winter	89.124	0.974	11.2	2850.6	O K
480 min Winter	89.154	1.004	11.2	2947.6	O K
600 min Winter	89.171	1.021	11.2	3002.6	O K
720 min Winter	89.180	1.030	11.2	3033.2	O K
960 min Winter	89.186	1.036	11.2	3050.7	O K
1440 min Winter	89.177	1.027	11.2	3022.6	O K
2160 min Winter	89.147	0.997	11.2	2924.0	O K
2880 min Winter	89.108	0.958	11.2	2801.6	O K
4320 min Winter	89.038	0.888	11.2	2576.2	O K
5760 min Winter	88.983	0.833	11.2	2403.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	16.398	0.0	1802.6	246
360 min Winter	11.872	0.0	1736.0	364
480 min Winter	9.356	0.0	1692.2	482
600 min Winter	7.748	0.0	1659.5	598
720 min Winter	6.628	0.0	1632.7	716
960 min Winter	5.163	0.0	1588.5	948
1440 min Winter	3.635	0.0	1515.4	1406
2160 min Winter	2.574	0.0	3297.8	2076
2880 min Winter	2.028	0.0	3193.8	2712
4320 min Winter	1.472	0.0	3018.9	3332
5760 min Winter	1.187	0.0	4784.6	4216

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 553575 226990 TL 53575 26990
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	5760
Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.049

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.683	4	8	1.683	8	12	1.683

Model Details

Storage is Online Cover Level (m) 89.950

Tank or Pond Structure

Invert Level (m) 88.150

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2652.0	1.800	3729.4

Hydro-Brake® Optimum Outflow Control

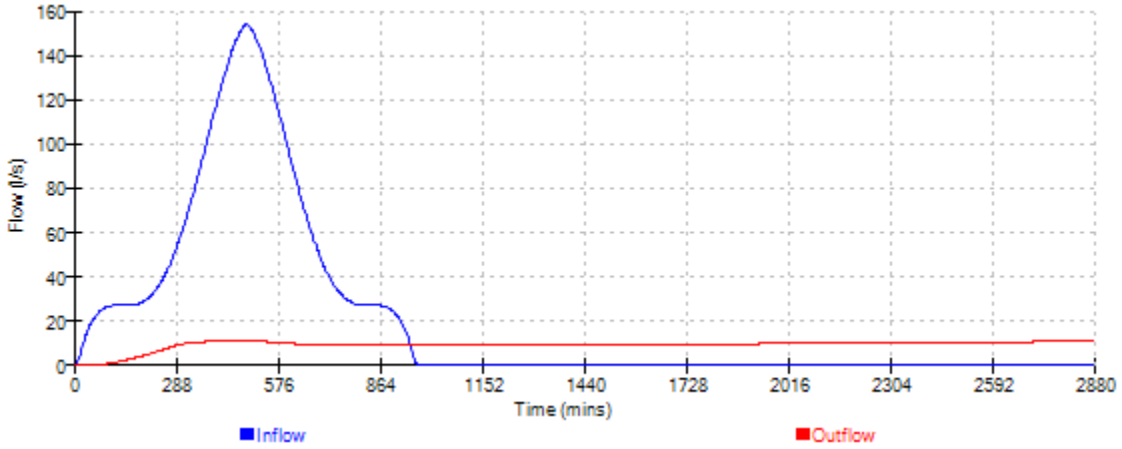
Unit Reference	MD-SHE-0146-1120-1500-1120
Design Head (m)	1.500
Design Flow (l/s)	11.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	146
Invert Level (m)	88.150
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

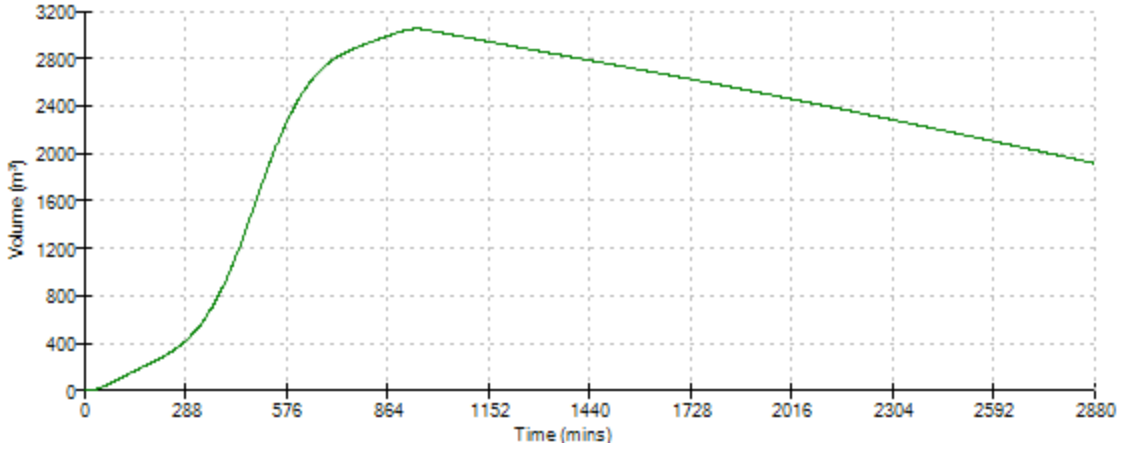
Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	11.2	Kick-Flo®	0.939	9.0
Flush-Flo™	0.440	11.2	Mean Flow over Head Range	-	9.7

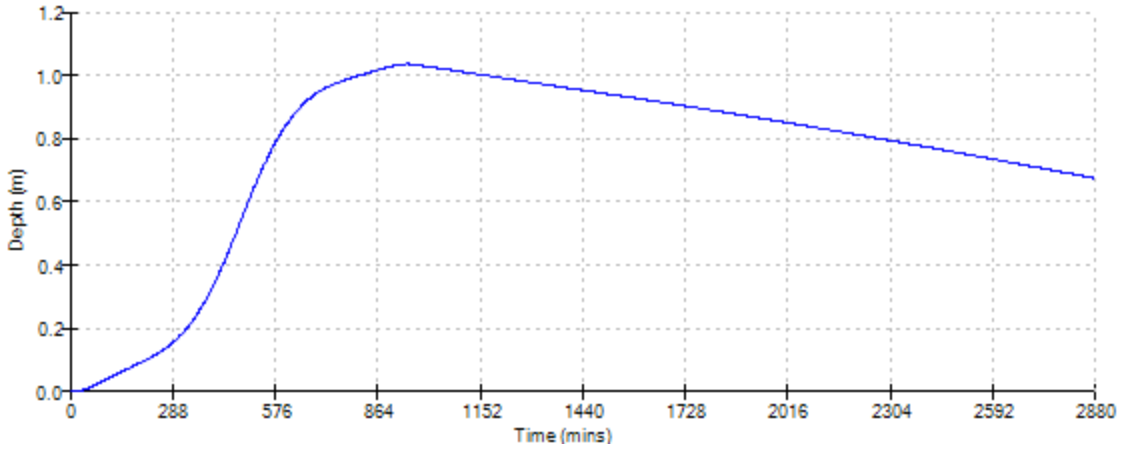
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	1.200	10.1	3.000	15.5	7.000	23.3
0.200	10.1	1.400	10.8	3.500	16.7	7.500	24.1
0.300	10.9	1.600	11.5	4.000	17.8	8.000	24.9
0.400	11.2	1.800	12.2	4.500	18.9	8.500	25.6
0.500	11.2	2.000	12.8	5.000	19.8	9.000	26.3
0.600	11.0	2.200	13.4	5.500	20.8	9.500	27.0
0.800	10.3	2.400	14.0	6.000	21.7		
1.000	9.3	2.600	14.5	6.500	22.5		

Event: 960 min Winter







Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	88.353	0.203	10.2	550.6	O K
30 min Summer	88.405	0.255	10.6	694.6	O K
60 min Summer	88.458	0.308	11.0	841.7	O K
120 min Summer	88.544	0.394	11.2	1088.6	O K
180 min Summer	88.589	0.439	11.2	1217.6	O K
240 min Summer	88.616	0.466	11.2	1295.7	O K
360 min Summer	88.644	0.494	11.2	1376.6	O K
480 min Summer	88.655	0.505	11.2	1408.9	O K
600 min Summer	88.658	0.508	11.2	1418.0	O K
720 min Summer	88.656	0.506	11.2	1413.6	O K
960 min Summer	88.646	0.496	11.2	1382.8	O K
1440 min Summer	88.626	0.476	11.2	1325.3	O K
2160 min Summer	88.603	0.453	11.2	1257.6	O K
2880 min Summer	88.582	0.432	11.2	1197.8	O K
4320 min Summer	88.548	0.398	11.2	1098.2	O K
5760 min Summer	88.519	0.369	11.1	1016.4	O K
15 min Winter	88.377	0.227	10.4	617.2	O K
30 min Winter	88.435	0.285	10.8	779.1	O K
60 min Winter	88.494	0.344	11.1	944.9	O K
120 min Winter	88.591	0.441	11.2	1223.9	O K
180 min Winter	88.642	0.492	11.2	1371.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	59.040	0.0	432.7	26
30 min Summer	37.440	0.0	558.0	41
60 min Summer	22.920	0.0	791.8	70
120 min Summer	15.065	0.0	1047.6	130
180 min Summer	11.413	0.0	1189.2	188
240 min Summer	9.253	0.0	1281.8	248
360 min Summer	6.762	0.0	1395.0	366
480 min Summer	5.356	0.0	1461.4	484
600 min Summer	4.452	0.0	1504.9	604
720 min Summer	3.819	0.0	1534.2	722
960 min Summer	2.989	0.0	1565.1	898
1440 min Summer	2.115	0.0	1557.0	1114
2160 min Summer	1.510	0.0	1993.6	1496
2880 min Summer	1.197	0.0	2099.9	1904
4320 min Summer	0.878	0.0	2275.9	2724
5760 min Summer	0.715	0.0	2572.2	3512
15 min Winter	59.040	0.0	489.9	26
30 min Winter	37.440	0.0	625.9	41
60 min Winter	22.920	0.0	890.5	70
120 min Winter	15.065	0.0	1173.7	128
180 min Winter	11.413	0.0	1328.5	186

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
240 min Winter	88.672	0.522	11.2	1461.0	O K
360 min Winter	88.705	0.555	11.2	1556.9	O K
480 min Winter	88.719	0.569	11.2	1598.4	O K
600 min Winter	88.724	0.574	11.2	1614.1	O K
720 min Winter	88.724	0.574	11.2	1614.9	O K
960 min Winter	88.716	0.566	11.2	1590.9	O K
1440 min Winter	88.688	0.538	11.2	1507.5	O K
2160 min Winter	88.656	0.506	11.2	1413.7	O K
2880 min Winter	88.625	0.475	11.2	1323.4	O K
4320 min Winter	88.570	0.420	11.2	1163.8	O K
5760 min Winter	88.523	0.373	11.1	1028.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	9.253	0.0	1427.9	244
360 min Winter	6.762	0.0	1545.4	360
480 min Winter	5.356	0.0	1609.6	476
600 min Winter	4.452	0.0	1647.1	590
720 min Winter	3.819	0.0	1667.5	704
960 min Winter	2.989	0.0	1675.0	924
1440 min Winter	2.115	0.0	1620.3	1214
2160 min Winter	1.510	0.0	2232.7	1624
2880 min Winter	1.197	0.0	2350.2	2076
4320 min Winter	0.878	0.0	2539.0	2944
5760 min Winter	0.715	0.0	2883.2	3752

Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 553575 226990 TL 53575 26990
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	5760
Climate Change %	+0

Time Area Diagram

Total Area (ha) 5.049

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.683	4	8	1.683	8	12	1.683

Model Details

Storage is Online Cover Level (m) 89.950

Tank or Pond Structure

Invert Level (m) 88.150

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2652.0	1.800	3729.4

Hydro-Brake® Optimum Outflow Control

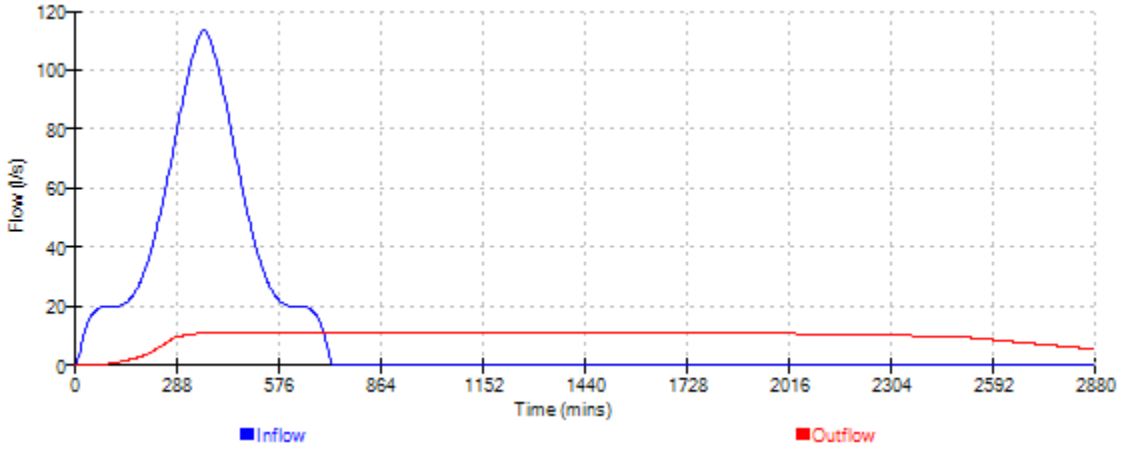
Unit Reference	MD-SHE-0146-1120-1500-1120
Design Head (m)	1.500
Design Flow (l/s)	11.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	146
Invert Level (m)	88.150
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

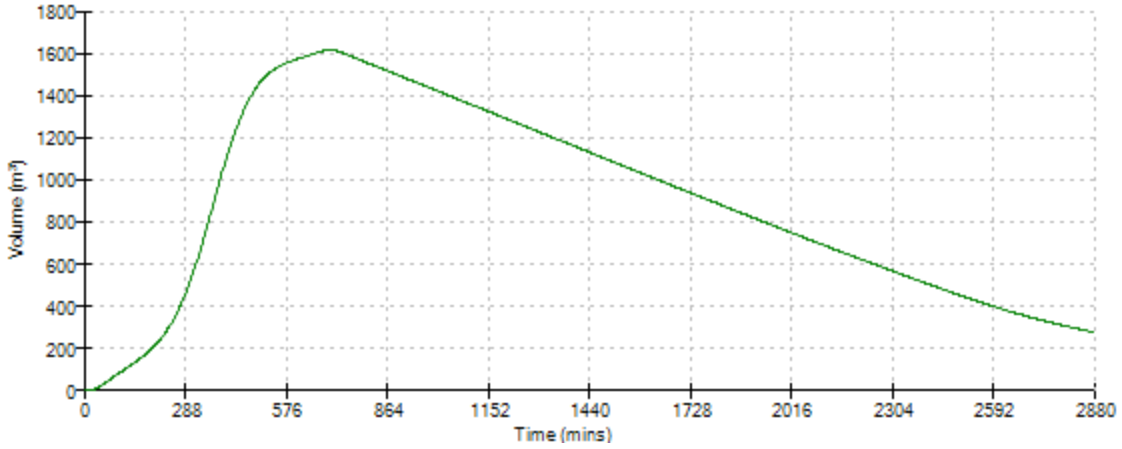
Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	11.2	Kick-Flo®	0.939	9.0
Flush-Flo™	0.440	11.2	Mean Flow over Head Range	-	9.7

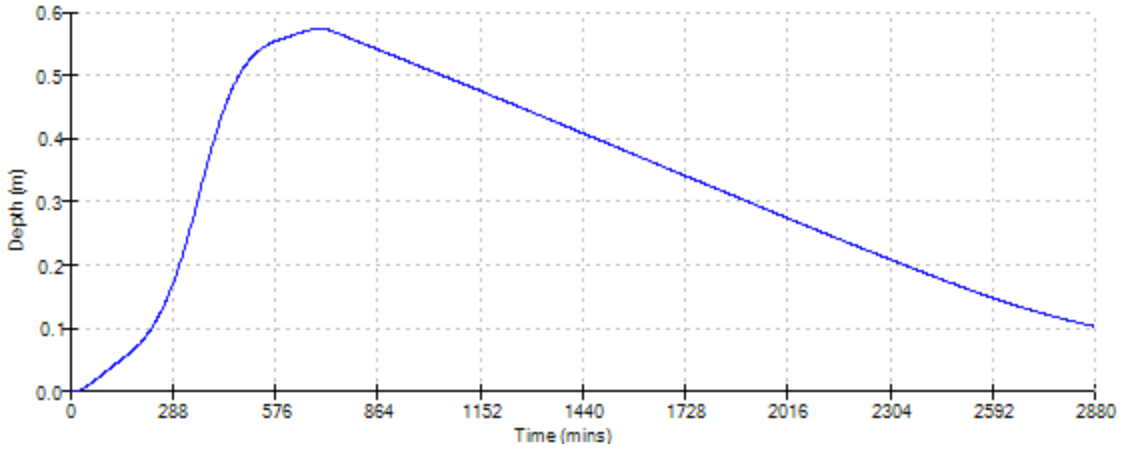
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	1.200	10.1	3.000	15.5	7.000	23.3
0.200	10.1	1.400	10.8	3.500	16.7	7.500	24.1
0.300	10.9	1.600	11.5	4.000	17.8	8.000	24.9
0.400	11.2	1.800	12.2	4.500	18.9	8.500	25.6
0.500	11.2	2.000	12.8	5.000	19.8	9.000	26.3
0.600	11.0	2.200	13.4	5.500	20.8	9.500	27.0
0.800	10.3	2.400	14.0	6.000	21.7		
1.000	9.3	2.600	14.5	6.500	22.5		

Event: 720 min Winter







Appendix I

SUDS MAINTENANCE & MANAGEMENT PLAN

Bloor Homes Ltd and Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith

LAND EAST OF STATION ROAD, ELSENHAM

SuDS Maintenance and Management Plan

4697-WSP-00-XX-RP-DR-0002
SEPTEMBER 2022

PUBLIC

Bloor **Homes Ltd and Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith**

LAND EAST OF STATION ROAD, ELSENHAM

SuDS Maintenance and Management Plan

SUDS M&M PLAN (REV 2.0) PUBLIC

PROJECT NO. 70084697

OUR REF. NO. 4697-WSP-00-XX-RP-DR-0002

SEPTEMBER 2022

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QUALITY CONTROL

Issue/revision	Revision 1.0	Revision 2.0	Revision 3.0	Revision 4.0
Remarks	Draft	For Outline Planning		
Date	23/09/2022	30/09/2022		
Prepared by	Hannah Li	Hannah Li		
Signature				
Checked by	Mattia Fagnano	Mattia Fagnano		
Signature				
Authorised by	Jason Giddings	Jason Giddings		
Signature				
Project number	70084697			
Report number	4697-WSP-00-XX-RP-DR-0002			
File reference	\\ukwspgroup.com\Projects\70084xxx\70084697 - Elsenham Stage 2\03 WIP\DR Drainage Engineer\05 Reports\FRA\Appendices\I - SuDS Maintenance and Management Plan			

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1

INTRODUCTION

1. INTRODUCTION

1.1. INTRODUCTION

1.1.1. This document has been produced on behalf of Bloor Homes Ltd and Gillian Smith, John Robert Carmichael Smith, Robert Giles Russell Smith and Andrew James Smith to support an outline planning application for the Phase 2 of a proposed residential development at Elsenham, Essex.

1.1.2. This report gives guidance on the maintenance of Sustainable Drainage Systems (SuDS) and outlines who will be responsible for the maintenance.

2

METHOD STATEMENT

2. METHOD STATEMENT

2.1. PERMEABLE PAVEMENT

2.1.1. Permeable block paving allows water to infiltrate through gaps between the blocks into a layer of gravel, from which it is intercepted by under-drains and discharges to the site wide surface water network.

2.1.2. The private roads are constructed in permeable paving. The maintenance of these shared road areas is the responsibility of the private management company appointed by the developer.

2.1.3. The operation and maintenance requirements are given in the table below:

Table 2-1 - Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations–pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip,has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required

Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

2.2. DETENTION BASIN

2.2.1. The detention basin will require ongoing regular maintenance to ensure continuing operation to design performance standards. Adequate access must be provided to all detention areas for inspection and maintenance.

2.2.2. Grass cutting should ideally retain grass lengths of 75-150 mm with cuttings to be disposed of offsite. Detention basins should be inspected to note rate of sediment accumulation, sediment should be removed once exceeding 25mm depth.

2.2.3. The operation and maintenance requirements are given in the table below:

Table 2-2 - Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually

Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

2.3. VORTEX FLOW CONTROLS

2.3.1. These are proprietary systems which are custom made to control the onsite flows. Some of the proposed flow controls may be prone to blocking and should be monitored closely.

2.3.2. The operation and maintenance requirements are given in the table below:

Table 2-3 - Vortex Flow Control Maintenance Requirements

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Remove litter and debris and grass cutting and removal of cuttings from the upstream SuDS to prevent these being washed into the control. Inspection of control chamber and removal of any sediments, debris etc.	Quarterly or as required following Monitoring
Remedial Actions	Check the orifice flow control fixings to manhole chamber and access into the control chamber is functional.	Quarterly or as required following Monitoring
Monitoring	Inspect flow controls and overflows and check flow are not impeded.	Monthly or after periods of heavy rainfall

2.4. DESIGN LIFE

2.4.1. The design life of the development is likely to exceed the design life of each of the SuDS components listed above.

2.4.2. During the routine inspections of any drainage components, it may become apparent that they have reached the end of their functional lifetime. In the interest of sustainability repairs should be the first-choice solution where practicable. If this is not the case, then it will be necessary for the property owners to undertake complete replacement of the component in question.

2.4.3. Maintenance of the system will be the responsibility of a private management company set up by the developer

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