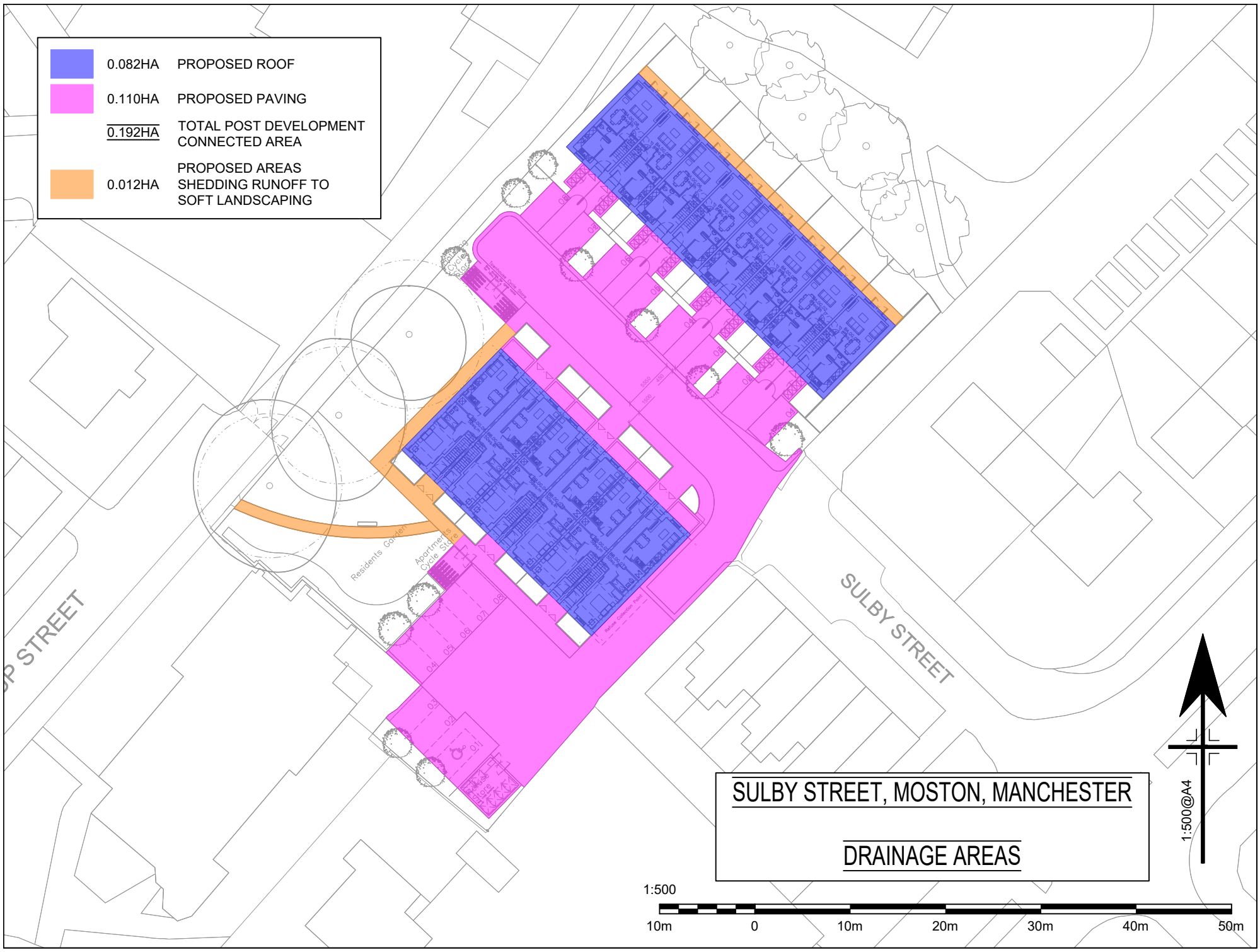
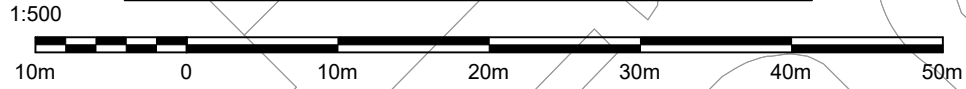


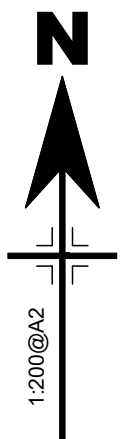
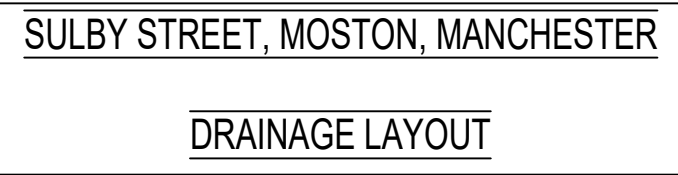
	0.082HA	PROPOSED ROOF
	0.110HA	PROPOSED PAVING
<u>0.192HA</u>	TOTAL POST DEVELOPMENT CONNECTED AREA	
	0.012HA	PROPOSED AREAS SHEDDING RUNOFF TO SOFT LANDSCAPING



SULBY STREET, MOSTON, MANCHESTER

DRAINAGE AREAS





FloodFlow Analysis Options

Method: Local-Inertia

Speed: Medium

Grid Size (m): 0.5

Surface: Urban

☒ Apply Exclusions

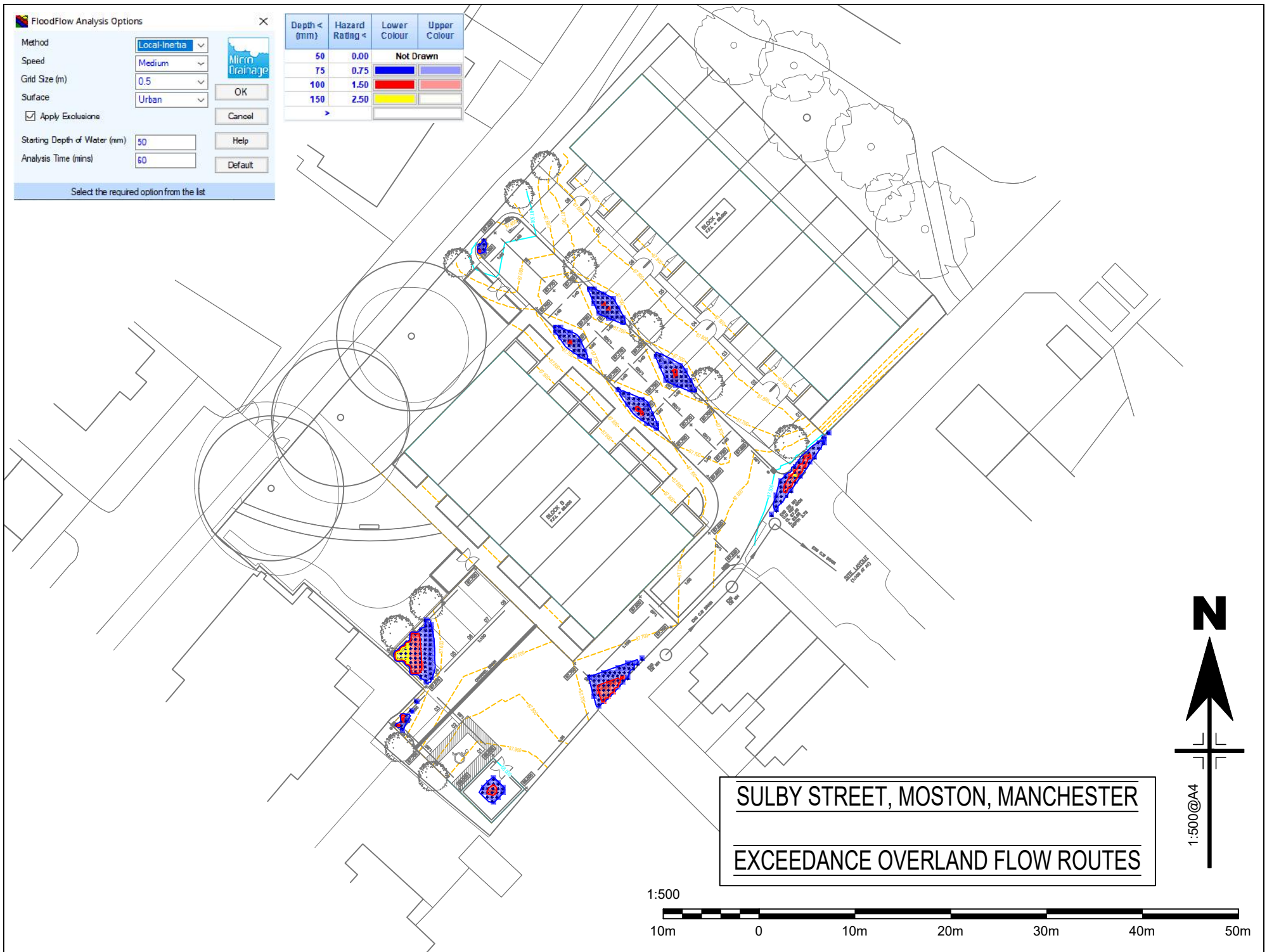
Starting Depth of Water (mm): 50

Analysis Time (mins): 60

OK Cancel Help Default

Select the required option from the list

Depth < (mm)	Hazard Rating <	Lower Colour	Upper Colour
50	0.00	Not Drawn	
75	0.75		
100	1.50		
150	2.50		



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Hillside Metal Bridge Durham, DH6 5NX	Sulby Street Moston Manchester M40 5HY	
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Innovyze	Source Control 2020.1.3	

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

Half Drain Time : 113 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	85.857	0.727	0.0	5.0	5.0	37.6	O K
30 min Summer	86.080	0.950	0.0	5.0	5.0	49.1	O K
60 min Summer	86.256	1.126	0.0	5.0	5.0	58.2	O K
120 min Summer	86.316	1.186	0.0	5.0	5.0	61.3	O K
180 min Summer	86.294	1.164	0.0	5.0	5.0	60.1	O K
240 min Summer	86.261	1.131	0.0	5.0	5.0	58.4	O K
360 min Summer	86.186	1.056	0.0	5.0	5.0	54.6	O K
480 min Summer	86.110	0.980	0.0	5.0	5.0	50.7	O K
600 min Summer	86.032	0.902	0.0	5.0	5.0	46.6	O K
720 min Summer	85.949	0.819	0.0	5.0	5.0	42.3	O K
960 min Summer	85.751	0.621	0.0	5.0	5.0	32.1	O K
1440 min Summer	85.473	0.343	0.0	5.0	5.0	17.7	O K
2160 min Summer	85.258	0.128	0.0	4.8	4.8	6.6	O K
2880 min Summer	85.165	0.035	0.0	4.3	4.3	1.8	O K
4320 min Summer	85.130	0.000	0.0	3.4	3.4	0.0	O K
5760 min Summer	85.130	0.000	0.0	2.7	2.7	0.0	O K
7200 min Summer	85.130	0.000	0.0	2.2	2.2	0.0	O K
8640 min Summer	85.130	0.000	0.0	1.9	1.9	0.0	O K
10080 min Summer	85.130	0.000	0.0	1.7	1.7	0.0	O K
15 min Winter	85.959	0.829	0.0	5.0	5.0	42.8	O K
30 min Winter	86.215	1.085	0.0	5.0	5.0	56.1	O K
60 min Winter	86.429	1.299	0.0	5.0	5.0	67.1	O K
120 min Winter	87.302	2.172	0.0	6.2	6.2	70.7	FLOOD
180 min Winter	87.301	2.171	0.0	6.2	6.2	69.8	FLOOD

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	119.103	0.0	42.8	19
30 min Summer	80.499	0.0	58.1	33
60 min Summer	52.002	0.0	75.0	62
120 min Summer	32.472	0.0	93.5	112
180 min Summer	24.299	0.0	105.3	144
240 min Summer	19.641	0.0	113.3	176
360 min Summer	14.470	0.0	125.2	246
480 min Summer	11.652	0.0	134.7	316
600 min Summer	9.841	0.0	141.9	386
720 min Summer	8.567	0.0	148.4	456
960 min Summer	6.878	0.0	158.9	578
1440 min Summer	5.037	0.0	174.5	808
2160 min Summer	3.681	0.0	191.3	1144
2880 min Summer	2.942	0.0	203.7	1476
4320 min Summer	2.142	0.0	222.5	0
5760 min Summer	1.707	0.0	236.6	0
7200 min Summer	1.431	0.0	247.8	0
8640 min Summer	1.240	0.0	257.7	0
10080 min Summer	1.099	0.0	266.4	0
15 min Winter	119.103	0.0	48.1	20
30 min Winter	80.499	0.0	65.2	33
60 min Winter	52.002	0.0	84.0	62
120 min Winter	32.472	2.5	104.8	112
180 min Winter	24.299	1.5	117.9	140

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Hillside Metal Bridge Durham, DH6 5NX	Sulby Street Moston Manchester M40 5HY	
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Innovyze	Source Control 2020.1.3	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	86.448	1.318	0.0	5.0	5.0	68.1	O K
360 min Winter	86.338	1.208	0.0	5.0	5.0	62.5	O K
480 min Winter	86.221	1.091	0.0	5.0	5.0	56.4	O K
600 min Winter	86.098	0.968	0.0	5.0	5.0	50.0	O K
720 min Winter	85.968	0.838	0.0	5.0	5.0	43.3	O K
960 min Winter	85.657	0.527	0.0	5.0	5.0	27.3	O K
1440 min Winter	85.313	0.183	0.0	4.9	4.9	9.4	O K
2160 min Winter	85.140	0.010	0.0	4.1	4.1	0.5	O K
2880 min Winter	85.130	0.000	0.0	3.3	3.3	0.0	O K
4320 min Winter	85.130	0.000	0.0	2.4	2.4	0.0	O K
5760 min Winter	85.130	0.000	0.0	1.9	1.9	0.0	O K
7200 min Winter	85.130	0.000	0.0	1.6	1.6	0.0	O K
8640 min Winter	85.130	0.000	0.0	1.4	1.4	0.0	O K
10080 min Winter	85.130	0.000	0.0	1.2	1.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	19.641	0.0	126.9	186
360 min Winter	14.470	0.0	140.3	264
480 min Winter	11.652	0.0	150.8	342
600 min Winter	9.841	0.0	159.2	416
720 min Winter	8.567	0.0	166.3	492
960 min Winter	6.878	0.0	177.9	606
1440 min Winter	5.037	0.0	195.4	814
2160 min Winter	3.681	0.0	214.2	1124
2880 min Winter	2.942	0.0	228.3	0
4320 min Winter	2.142	0.0	249.3	0
5760 min Winter	1.707	0.0	264.9	0
7200 min Winter	1.431	0.0	277.6	0
8640 min Winter	1.240	0.0	288.6	0
10080 min Winter	1.099	0.0	298.4	0

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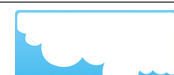
Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.400	Shortest Storm (mins)	15
Ratio R	0.340	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.192

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.146	4	8	0.047

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Model Details

Storage is Online Cover Level (m) 87.300

Cellular Storage Structure

Invert Level (m) 85.130 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	54.4	0.0	1.320	54.4	0.0	1.321	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0099-5000-1450-5000
Design Head (m) 1.450
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 99
Invert Level (m) 85.000
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)	1.450	5.0	Kick-Flo®	0.882	4.0
Flush-Flo™	0.432	5.0	Mean Flow over Head Range	-	4.4

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)	Depth (m)	Flow (l/s)
0.100	3.2	0.800	4.4	2.000	5.8	4.000	8.0	7.000	10.5
0.200	4.5	1.000	4.2	2.200	6.1	4.500	8.5	7.500	10.8
0.300	4.9	1.200	4.6	2.400	6.3	5.000	8.9	8.000	11.2
0.400	5.0	1.400	4.9	2.600	6.6	5.500	9.3	8.500	11.5
0.500	5.0	1.600	5.2	3.000	7.0	6.000	9.7	9.000	11.8
0.600	4.9	1.800	5.5	3.500	7.5	6.500	10.1	9.500	12.1

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.400	Add Flow / Climate Change (%)	0
Ratio R	0.340	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.146	4-8	0.047

Total Area Contributing (ha) = 0.192

Total Pipe Volume (m³) = 4.408

Network Design Table for Surface Network 1

- Indicates pipe length does not match coordinates

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	39.096	0.390	100.2	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	13.390	0.130	103.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	15.799	0.155	101.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	23.296	0.235	99.1	0.039	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	11.031	0.275	40.1	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	28.509	0.285	100.0	0.021	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	44.13	5.65	87.240	0.020	0.0	0.0	0.0	1.00	17.7	2.4
1.001	43.38	5.87	86.850	0.020	0.0	0.0	0.0	0.99	17.5	2.4
1.002	42.54	6.14	86.720	0.020	0.0	0.0	0.0	1.00	17.6	2.4
2.000	45.05	5.38	86.800	0.039	0.0	0.0	0.0	1.01	17.8	4.8
1.003	42.19	6.25	86.565	0.068	0.0	0.0	0.0	1.59	28.2	7.8
3.000	44.74	5.47	86.760	0.021	0.0	0.0	0.0	1.00	17.8	2.5

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Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.001	16.690	0.210	79.5	0.043	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.002	23.441	0.240	97.7	0.041	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.003	5.632	0.050	112.6	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	1.165#	0.020	58.3	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	2.495	0.130	19.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	4.647	0.050	92.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	5.574	0.140	39.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.001	44.08	5.66	86.400	0.064	0.0	0.0	0.0	1.47	58.4	7.6
3.002	43.11	5.96	86.190	0.105	0.0	0.0	0.0	1.32	52.6	12.2
3.003	42.87	6.03	85.950	0.111	0.0	0.0	0.0	1.23	49.0	12.9
1.004	42.15	6.27	85.150	0.192	0.0	0.0	0.0	1.72	68.3	22.0
1.005	42.10	6.28	85.130	0.192	0.0	0.0	0.0	2.31	40.8	22.0
1.006	41.87	6.36	85.000	0.192	0.0	0.0	0.0	1.04	18.4«	22.0
1.007	41.70	6.42	83.820	0.192	0.0	0.0	0.0	1.60	28.3	22.0

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PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	RE2	87.830	87.240	0.440	Open Manhole	100
1.001	o	150	SW4	87.850	86.850	0.850	Open Manhole	450
1.002	o	150	SW5	87.850	86.720	0.980	Open Manhole	450
2.000	o	150	RE3	87.840	86.800	0.890	Open Manhole	150
1.003	o	150	SW6	87.850	86.565	1.135	Open Manhole	900
3.000	o	150	RE1	87.850	86.760	0.940	Open Manhole	150
3.001	o	225	SW1	87.650	86.400	1.025	Open Manhole	900
3.002	o	225	SW2	87.620	86.190	1.205	Open Manhole	900
3.003	o	225	SW3	87.850	85.950	1.675	Open Manhole	900
1.004	o	225	SW7 CP	87.680	85.150	2.305	Open Manhole	900
1.005	o	150	TANK	87.300	85.130	2.020	Open Manhole	100
1.006	o	150	SW8 FC	87.705	85.000	2.555	Open Manhole	1800
1.007	o	150	CW1	87.620	83.820	3.650	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	39.096	100.2	SW4	87.850	86.850	0.850	Open Manhole	450
1.001	13.390	103.0	SW5	87.850	86.720	0.980	Open Manhole	450
1.002	15.799	101.9	SW6	87.850	86.565	1.135	Open Manhole	900
2.000	23.296	99.1	SW6	87.850	86.565	1.135	Open Manhole	900
1.003	11.031	40.1	SW7 CP	87.680	86.290	1.240	Open Manhole	900
3.000	28.509	100.0	SW1	87.650	86.475	1.025	Open Manhole	900
3.001	16.690	79.5	SW2	87.620	86.190	1.205	Open Manhole	900
3.002	23.441	97.7	SW3	87.850	85.950	1.675	Open Manhole	900
3.003	5.632	112.6	SW7 CP	87.680	85.900	1.555	Open Manhole	900
1.004	1.165#	58.3	TANK	87.300	85.130	1.945	Open Manhole	100
1.005	2.495	19.2	SW8 FC	87.705	85.000	2.555	Open Manhole	1800
1.006	4.647	92.9	CW1	87.620	84.950	2.520	Open Manhole	1200
1.007	5.574	39.8	UU4506	87.400	83.680	3.570	Open Manhole	1200

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Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.020	0.020	0.020
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
2.000	User	-	100	0.019	0.019	0.019
	User	-	100	0.020	0.020	0.039
1.003	User	-	100	0.008	0.008	0.008
3.000	User	-	100	0.021	0.021	0.021
3.001	User	-	100	0.043	0.043	0.043
3.002	User	-	100	0.021	0.021	0.021
	User	-	100	0.010	0.010	0.031
	User	-	100	0.006	0.006	0.037
	User	-	100	0.004	0.004	0.041
3.003	User	-	100	0.007	0.007	0.007
1.004	User	-	100	0.008	0.008	0.008
	User	-	100	0.005	0.005	0.013
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.192	0.192	0.192

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	UU4506	87.400	83.680	0.000	1200	0

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Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: SW8 FC, DS/PN: 1.006, Volume (m³): 6.9

Unit Reference	MD-SHE-0099-5000-1450-5000
Design Head (m)	1.450
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	99
Invert Level (m)	85.000
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)	1.450	5.0	Kick-Flo®	0.882	4.0
Flush-Flo™	0.432	5.0	Mean Flow over Head Range	-	4.4

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)	Depth (m)	Flow (l/s)
0.100	3.2	0.800	4.4	2.000	5.8	4.000	8.0	7.000	10.5
0.200	4.5	1.000	4.2	2.200	6.1	4.500	8.5	7.500	10.8
0.300	4.9	1.200	4.6	2.400	6.3	5.000	8.9	8.000	11.2
0.400	5.0	1.400	4.9	2.600	6.6	5.500	9.3	8.500	11.5
0.500	5.0	1.600	5.2	3.000	7.0	6.000	9.7	9.000	11.8
0.600	4.9	1.800	5.5	3.500	7.5	6.500	10.1	9.500	12.1

Storage Structures for Surface Network 1

Cellular Storage Manhole: TANK, DS/PN: 1.005

Invert Level (m) 85.130 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	54.4	0.0	1.320	54.4	0.0	1.321	0.0	0.0

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.400 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.340 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Duration (mins)	First (X) Surcharge	Water Level	Surcharged Depth	Flooded Volume	Flow / Cap.	Half Drain Time	Pipe Flow	Status
				(m)	(m)	(m ³)		(mins)	(l/s)	
1.000	RE2	15		87.278	-0.112	0.000	0.14		2.4	OK
1.001	SW4	15		86.889	-0.111	0.000	0.15		2.4	OK
1.002	SW5	15	100/15 Summer	86.758	-0.112	0.000	0.15		2.4	OK
2.000	RE3	15	100/15 Summer	86.854	-0.096	0.000	0.28		4.7	OK
1.003	SW6	15	100/15 Summer	86.623	-0.092	0.000	0.31		7.9	OK
3.000	RE1	15		86.798	-0.112	0.000	0.14		2.5	OK
3.001	SW1	15	100/15 Summer	86.455	-0.170	0.000	0.13		6.9	OK
3.002	SW2	15	100/15 Summer	86.263	-0.152	0.000	0.23		11.1	OK
3.003	SW3	15	30/15 Summer	86.045	-0.130	0.000	0.37		11.8	OK
1.004	SW7 CP	30	30/15 Summer	85.291	-0.084	0.000	0.59		17.7	OK
1.005	TANK	30	1/30 Winter	85.290	0.010	0.000	0.29	21	6.6	SURCHARGED
1.006	SW8 FC	60	1/15 Summer	85.292	0.142	0.000	0.34		4.8	SURCHARGED
1.007	CW1	30		83.866	-0.104	0.000	0.21		4.8	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.400 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.340 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Duration (mins)	First (X) Surcharge	Water			Flow / Cap.	Half Drain Time (mins)	Pipe Flow (l/s)	Status
				Level (m)	Depth (m)	Volume (m³)				
1.000	RE2	15		87.302	-0.088	0.000	0.34		5.9	OK
1.001	SW4	15		86.913	-0.087	0.000	0.37		5.9	OK
1.002	SW5	15	100/15 Summer	86.782	-0.088	0.000	0.36		5.9	OK
2.000	RE3	15	100/15 Summer	86.892	-0.058	0.000	0.67		11.4	OK
1.003	SW6	15	100/15 Summer	86.666	-0.049	0.000	0.78		19.6	OK
3.000	RE1	15		86.823	-0.087	0.000	0.35		6.0	OK
3.001	SW1	15	100/15 Summer	86.496	-0.129	0.000	0.38		19.6	OK
3.002	SW2	15	100/15 Summer	86.326	-0.089	0.000	0.67		32.3	OK
3.003	SW3	15	30/15 Summer	86.177	0.002	0.000	1.06		33.3	SURCHARGED
1.004	SW7 CP	60	30/15 Summer	85.704	0.329	0.000	1.03		30.9	SURCHARGED
1.005	TANK	60	1/30 Winter	85.702	0.422	0.000	0.27	58	6.2	SURCHARGED
1.006	SW8 FC	60	1/15 Summer	85.706	0.556	0.000	0.35		5.0	SURCHARGED
1.007	CW1	60		83.867	-0.103	0.000	0.21		5.0	OK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.400 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.340 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Duration (mins)	First (X) Surcharge	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	RE2	15		87.328	-0.062	0.000	0.62		10.6	OK
1.001	SW4	15		86.986	-0.014	0.000	0.64		10.2	OK
1.002	SW5	15	100/15 Summer	86.941	0.071	0.000	0.67		10.9	SURCHARGED
2.000	RE3	15	100/15 Summer	87.217	0.267	0.000	1.20		20.3	SURCHARGED
1.003	SW6	15	100/15 Summer	86.893	0.178	0.000	1.27		32.2	SURCHARGED
3.000	RE1	15		86.849	-0.061	0.000	0.64		10.8	OK
3.001	SW1	15	100/15 Summer	86.692	0.067	0.000	0.65		33.5	SURCHARGED
3.002	SW2	15	100/15 Summer	86.605	0.190	0.000	1.13		54.6	SURCHARGED
3.003	SW3	120	30/15 Summer	86.447	0.272	0.000	0.67		21.2	SURCHARGED
1.004	SW7 CP	120	30/15 Summer	86.445	1.070	0.000	1.21		36.1	SURCHARGED
1.005	TANK	120	1/30 Winter	86.443	1.163	0.000	0.27	149	6.2	SURCHARGED
1.006	SW8 FC	120	1/15 Summer	86.444	1.294	0.000	0.36		5.0	SURCHARGED
1.007	CW1	120		83.867	-0.103	0.000	0.21		5.0	OK

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FOUL SEWERAGE DESIGN

Design Criteria for Foul Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	1.500
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	7.733	0.190	40.7	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
1.001	1.492	0.040	37.3	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
1.002	7.733	0.095	81.4	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
1.003	1.492	0.020	74.6	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
1.004	7.733	0.095	81.4	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
1.005	1.492	0.020	74.6	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
1.006	7.848	0.100	78.5	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
1.007	12.031	0.300	40.1	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
2.000	8.605	0.215	40.0	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
2.001	1.014	0.025	40.6	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
2.002	7.986	0.205	39.0	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
2.003	1.014	0.020	50.7	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
2.004	8.105	0.110	73.7	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
2.005	4.632	0.115	40.3	0.000	1	0.0	1.500	o	100	Pipe/Conduit	
1.008	5.574	0.140	39.8	0.000	0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	87.100	0.000	0.0	1	0.0	6	0.26	1.05	8.2	0.0
1.001	86.910	0.000	0.0	2	0.0	8	0.34	1.09	8.6	0.1
1.002	86.870	0.000	0.0	3	0.0	11	0.29	0.74	5.8	0.1
1.003	86.775	0.000	0.0	4	0.0	12	0.33	0.77	6.1	0.2
1.004	86.755	0.000	0.0	5	0.0	14	0.35	0.74	5.8	0.2
1.005	86.660	0.000	0.0	6	0.0	15	0.38	0.77	6.1	0.3
1.006	86.640	0.000	0.0	7	0.0	16	0.39	0.75	5.9	0.3
1.007	86.540	0.000	0.0	8	0.0	15	0.52	1.05	8.3	0.4
2.000	87.100	0.000	0.0	1	0.0	6	0.26	1.05	8.3	0.0
2.001	86.885	0.000	0.0	2	0.0	8	0.33	1.05	8.2	0.1
2.002	86.860	0.000	0.0	3	0.0	9	0.38	1.07	8.4	0.1
2.003	86.655	0.000	0.0	4	0.0	11	0.38	0.94	7.3	0.2
2.004	86.635	0.000	0.0	5	0.0	14	0.36	0.78	6.1	0.2
2.005	86.525	0.000	0.0	6	0.0	13	0.47	1.05	8.3	0.3
1.008	83.820	0.000	0.0	14	0.0	17	0.59	1.39	24.6	0.6

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PIPELINE SCHEDULES for Foul Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	100	FW7	87.850	87.100	0.650	Open Manhole	450
1.001	o	100	FW8	87.850	86.910	0.840	Open Manhole	450
1.002	o	100	FW9	87.850	86.870	0.880	Open Manhole	450
1.003	o	100	FW10	87.850	86.775	0.975	Open Manhole	450
1.004	o	100	FW11	87.850	86.755	0.995	Open Manhole	450
1.005	o	100	FW12	87.850	86.660	1.090	Open Manhole	450
1.006	o	100	FW13	87.850	86.640	1.110	Open Manhole	450
1.007	o	100	FW14	87.850	86.540	1.210	Open Manhole	450
2.000	o	100	FW1	87.850	87.100	0.650	Open Manhole	450
2.001	o	100	FW2	87.850	86.885	0.865	Open Manhole	450
2.002	o	100	FW3	87.850	86.860	0.890	Open Manhole	450
2.003	o	100	FW4	87.850	86.655	1.095	Open Manhole	450
2.004	o	100	FW5	87.850	86.635	1.115	Open Manhole	450
2.005	o	100	FW6	87.730	86.525	1.105	Open Manhole	450
1.008	o	150	CW1	87.620	83.820	3.650	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	7.733	40.7	FW8	87.850	86.910	0.840	Open Manhole	450
1.001	1.492	37.3	FW9	87.850	86.870	0.880	Open Manhole	450
1.002	7.733	81.4	FW10	87.850	86.775	0.975	Open Manhole	450
1.003	1.492	74.6	FW11	87.850	86.755	0.995	Open Manhole	450
1.004	7.733	81.4	FW12	87.850	86.660	1.090	Open Manhole	450
1.005	1.492	74.6	FW13	87.850	86.640	1.110	Open Manhole	450
1.006	7.848	78.5	FW14	87.850	86.540	1.210	Open Manhole	450
1.007	12.031	40.1	CW1	87.620	86.240	1.280	Open Manhole	1200
2.000	8.605	40.0	FW2	87.850	86.885	0.865	Open Manhole	450
2.001	1.014	40.6	FW3	87.850	86.860	0.890	Open Manhole	450
2.002	7.986	39.0	FW4	87.850	86.655	1.095	Open Manhole	450
2.003	1.014	50.7	FW5	87.850	86.635	1.115	Open Manhole	450
2.004	8.105	73.7	FW6	87.730	86.525	1.105	Open Manhole	450
2.005	4.632	40.3	CW1	87.620	86.410	1.110	Open Manhole	1200
1.008	5.574	39.8	UU4506	87.400	83.680	3.570	Open Manhole	1200

Free Flowing Outfall Details for Foul Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008	UU4506	87.400	83.680	0.000	1200	0

Technical Specification

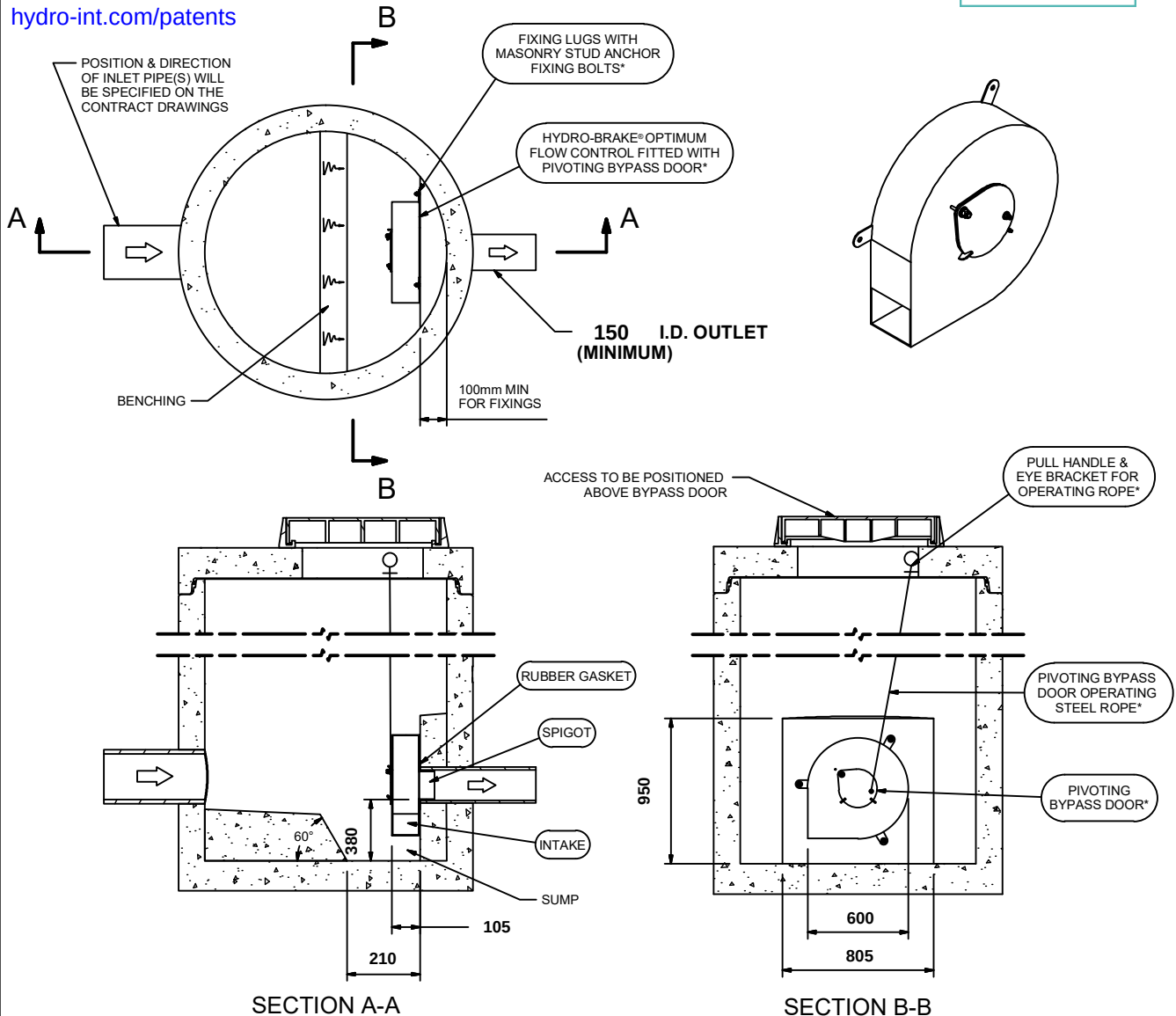
Control Point	Head (m)	Flow (l/s)
Primary Design	1.450	5.000
Flush-Flo™	0.432	4.975
Kick-Flo®	0.882	3.970
Mean Flow		4.376

Hydro-Brake® Optimum Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- Indicative Weight: 20 kg



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IMPORTANT:

○ LIMIT OF HYDRO INTERNATIONAL SUPPLY

THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS

* WHERE SUPPLIED

HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

**DESIGN
ADVICE**



The head/flow characteristics of this SHE-0099-5000-1450-5000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

**Hydro
International**

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DATE 01/12/2023 14:55

SITE Sulby Street

DESIGNER Chris Emm

REF 171A42

SHE-0099-5000-1450-5000

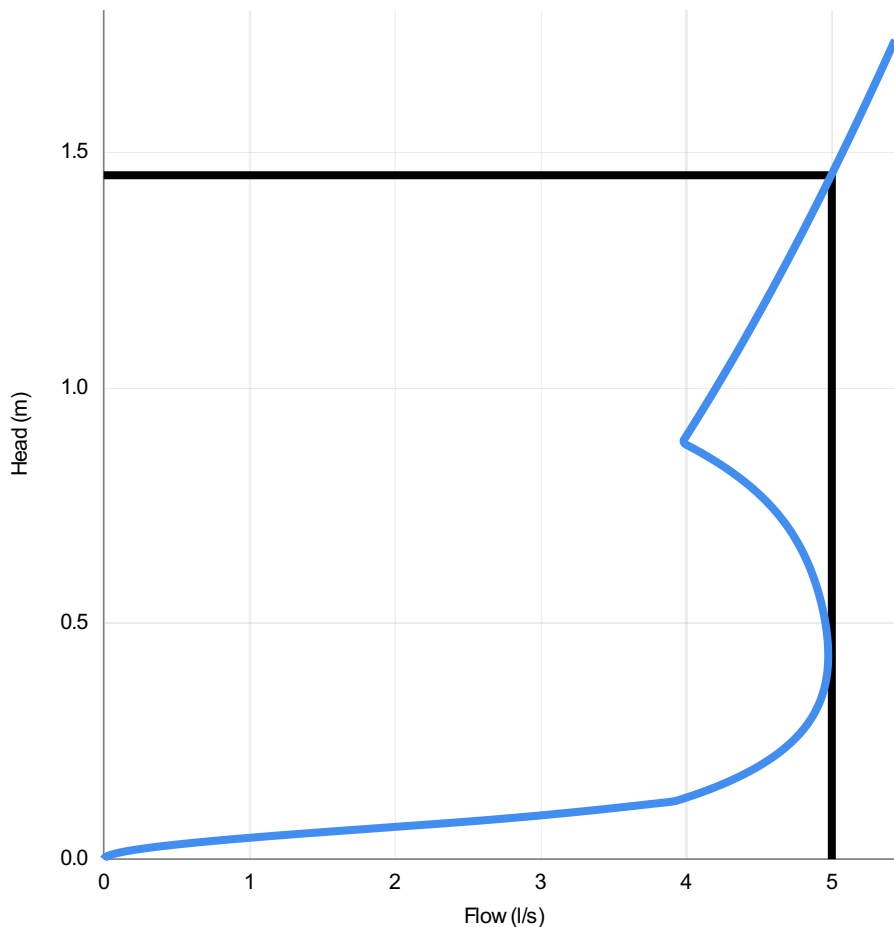
Hydro-Brake® Optimum

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.450	5.000
Flush-Flo	0.432	4.975
Kick-Flo®	0.882	3.970
Mean Flow		4.376



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Head (m)	Flow (l/s)
0.000	0.000
0.050	1.195
0.100	3.248
0.150	4.178
0.200	4.514
0.250	4.729
0.300	4.862
0.350	4.937
0.400	4.970
0.450	4.974
0.500	4.956
0.550	4.922
0.600	4.871
0.650	4.802
0.700	4.707
0.750	4.577
0.800	4.401
0.850	4.166
0.900	4.007
0.950	4.108
1.000	4.206
1.050	4.302
1.100	4.395
1.150	4.487
1.200	4.576
1.250	4.663
1.300	4.749
1.350	4.833
1.400	4.915
1.450	4.996

DESIGN ADVICE



The head/flow characteristics of this SHE-0099-5000-1450-5000 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

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DATE 01/12/2023 14:55

Site Sulby Street

DESIGNER Chris Emm

Ref 171A42

SHE-0099-5000-1450-5000

Hydro-Brake Optimum®

Stormbloc® is a cost-effective stormwater geocellular block system which provides underground storage or infiltration of stormwater suitable for landscaped or low-traffic areas. Access for inspection and maintenance can be included where required using Stormbloc® Inspect chambers and Stormbloc® Extra blocks.

Stormbloc® Components

The standard Stormbloc® block is a standalone component which just requires a base plate for the bottom layer of the tank.

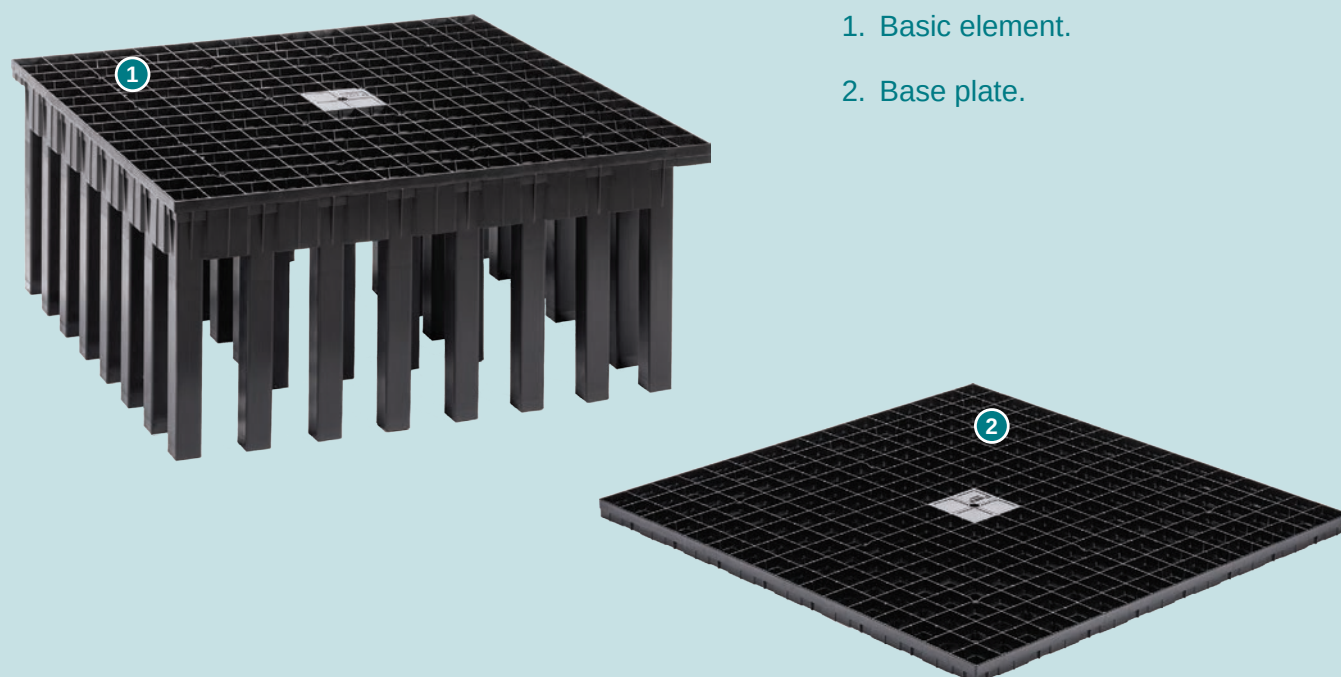


Figure 1 - Stormbloc® components.

Benefits

Customise Your Storage

Length, width and depth of storage can be customised in order to meet even the most demanding of drainage environments.

Save Space On Site

Stormbloc® stacks into compact nests for transportation and storage, saving valuable space during transport and on site.

Lightweight and Strong

Combining strength with a storage coefficient of 96%, Stormbloc® allows you to plan and design effective SuDS systems for low traffic or landscaped areas.

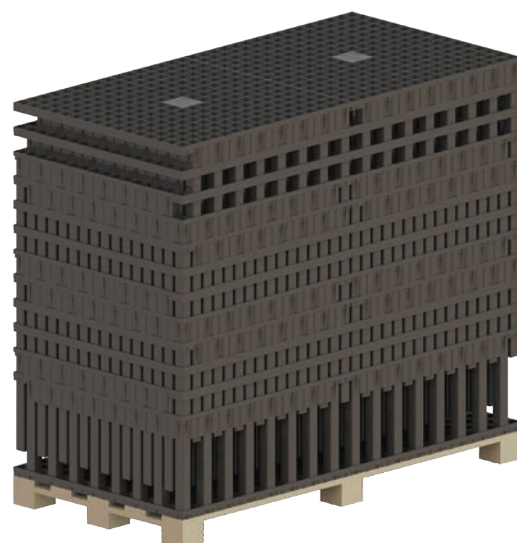


Figure 2 - Stormbloc® components stacked on a pallet

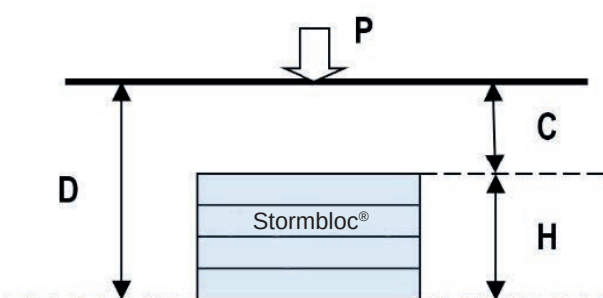
Dimensions, capacity and strength

	Stormbloc® Half Block
Material	Polypropylene
	Stormbloc® is manufactured from approved recycled polypropylene. Due to its long life and minor maintenance requirements, there is a reduced need for recycling during its life span. At the end of the life cycle, Stormbloc® can be recycled safely at minimal risk to the environment.
Length / Width / Height	800 / 800 / 330 mm (Note: for the bottom layer add 30 mm for the base plate)
Constructed Block Weight	10 kg (1 element and 1 base plate)
Nominal Block Volume	0.230 m³
Nominal Storage Capacity per Unit	0.220 m³
Porosity	96%
Vertical Ultimate Compressive Strength	313 kN/m²
Horizontal Ultimate Compressive Strength	93 kN/m²

Table 1 - Stormbloc® Extra technical data.

Structural testing

Stormbloc® has undergone extensive 3rd party structural testing and FEA modelling to ensure that it is suitable for the low traffic or landscaped loadings.



C = Cover Depth
D = Maximum Installation Depth
H = Height of System

Landscaped area with no access for vehicular traffic	Traffic loading $\leq 2.5t$
	
$C \geq 0.5$ $D \leq 3.0$ $0.36 \leq H \leq 2.01$ Groundwater - None	$C \geq 0.8$ $D \leq 3.0$ $0.36 \leq H \leq 2.01$ Groundwater - None

Table 2 - Stormbloc® loading parameters.

Figure 3 - Stormbloc® loading.

Expert Design Service

Hydro's professional engineers are on hand to provide free support for Stormbloc® storage / infiltration tank design.

Call +44 (0)1275 337937 or email stormwater@hydro-int.com

Detail design

Hydro International offers a free outline design service, ensuring the most efficient and cost-effective solution for infiltration / soakaway and storage structures. A further, more detailed Hydrological Analysis service is also available if required.

The use of good engineering practice and awareness of the limitations of all materials used will avoid construction and operational problems. Hydro International has an expert and dedicated workforce capable of providing advice on many aspects of system design.

1. Storage volume calculation

The system designer needs to calculate the volume of storage required. There are a number of suitable methods that can be used to calculate the storage volume. These vary from relatively simple manual methods to sophisticated simulation models.

As part of Hydro International's free design service we offer an estimated storage volume using the industry standard drainage modelling software suite: MicroDrainage®.

General design guidance on modelling of Stormbloc® and Hydro-Brake® Optimum vortex flow controls can also be found on our website: hydro-int.com/resources.

Design Requirements

To be able to carry out storage calculations we require the following, site specific information:

Infiltration Systems

1. Design Return Period
2. Site Location
3. Drained Impermeable Area
4. Soil Infiltration Rate*

Storage Systems

1. Design Return Period
2. Site Location
3. Drained Impermeable Area
4. Maximum Allowable Discharge Rate

* The soil infiltration rate should be derived from a site porosity test using a recognised method (eg. BRE digest 365).

2. Location and layout

Consider the most appropriate and cost-effective location for the infiltration/storage facility. The flexibility afforded by Stormbloc® combined with the substantial reduction in volume required (when compared with gravel pits for instance) allows the design of storage into locations that would be impractical for traditional systems.

Due to the modular nature of the system, Stormbloc® can be assembled to virtually any size, shape, depth or configuration and obstructions such as trees, pipework and rock outcrops can easily be circumvented.

Pipe connections can be made from multiple directions into the Stormbloc® system. Inspection / maintenance chambers should be made at critical points (eg. inlet, change of flow direction) to provide a continuous flow path through the system regardless of changes of flow direction.

The Stormbloc® system can be installed in locations including under lightly-trafficked roads, footpaths, public open spaces, landscaped areas, gardens, tennis courts and playing fields.

For infiltration systems consideration should be given to the soil conditions of the intended location of the tank. The soil should have a suitable percolation rate (typically > 0.05 m/hr), should be free of contaminants and should not have a high groundwater level.

3. Depth and dimensions of the system

The Stormbloc® system is flexible and allows the system designer to consider a range of options not normally available with other storage systems. There are, however, certain limiting factors that need to be considered:

3.1 Depth of Subgrade Layer

The base of the excavation should form a sound working platform and have a sand or gravel subgrade layer to provide a level support base for the system. This should be at least 100 mm deep and be flat and even. Extra care should be given to this subgrade layer for larger installations, and in particular for multilayered designs.

3.2 Lateral Loadings

The maximum depth to the base of the units is limited by the lateral (sideways) pressure that acts on the units. This is due to earth and water pressure and the effects of surcharges on the surface. The exact pressure from groundwater should be assessed on a site-by-site basis if groundwater is present above the base of the units.

3.3 Depth to Base

If the depth to the base of the system is greater than 3.0 m, please contact Hydro International for specific design assistance. Deeper installations may be possible under certain conditions.

3.4 Backfill / Cover

Stormbloc® should be installed with a minimum depth of cover of 0.5 m under landscaped / non-trafficked areas to protect from damage with gardening or agricultural implements, and 0.8 m under light traffic loaded areas.

For installations where the system will be subject to loading from light traffic the depth of cover should allow the dispersion of surface loading (in particular point loads) such that the loading to the top of the Stormbloc® is distributed evenly. The material should be carefully compacted in layers to form a depth to suit the maximum expected loads.

As a general guide the following depths of ground cover above the Stormbloc® modules should be adhered to according to the likely loading.

	Loading	
	Landscaped Area with No Access for Vehicular Traffic	Light Traffic Loading of 2.5 t
Coverage C (m)	$C \geq 0.5$	$C \geq 0.8$
Installation Depth D (m)	$D \leq 3.0$	$D \leq 3.0$
Height H of System (m)	$0.36 \leq H \leq 2.01$	$0.36 \leq H \leq 2.01$
Groundwater	None	None

Table 3 - Stormbloc® loading parameters.

The actual loading rate on the modules should always be checked by the system designer.

The material used for the construction above the Stormbloc® system should be selected according to the surface loadings. A non-angular granular material (nominally 100 mm thick) should be used immediately next to the geotextile or membrane surrounding the system so as to protect it from puncturing. Alternatively a geotextile fleece may be used.

3.4 Gradient

Stormbloc® can be laid to a gradient to aid the flow of stormwater through the system. Stormbloc® has, however, been designed and developed to provide resistance to loads applied predominantly in the vertical plane. Laying Stormbloc® to a gradient will therefore slightly reduce the transient and long term loads that the system can withstand. Gradients of 1:100 should generally not be exceeded.

3.5 Flotation

If it is necessary to install a Stormbloc® system within the groundwater table then flotation needs to be considered. In simple terms, there needs to be a greater force acting over the system (ie. the weight of the backfill) to compensate for the up-thrust caused by buoyancy. This should be checked by a suitably qualified and experienced engineer.

If the system is installed within the groundwater table it is advisable that encapsulation of the system is carried out to ensure the system is 100% watertight. Failure to do so could reduce the available storage capacity of the Stormbloc® system.

4. Designing the Stormbloc® tank

A completed Stormbloc® tank comprises of 6 different components:

- 4.1 Stormbloc® Blocks
- 4.2 Pipe Adaptors
- 4.3 Access Chambers
- 4.4 Catchpits
- 4.5 Inlet and Outlets
- 4.6 Geotextiles and Geomembranes

4.1 Stormbloc® Blocks

The main infiltration or storage tank is comprised of Stormbloc® modules in a configuration to suit the location. A single half block, 0.8 m x 0.8 m x 0.33 m, holds 0.220 m³ of stormwater and so the design should incorporate a sufficient number of blocks to provide the required volume.

A layer of base plates should be laid directly onto the geotextile or membrane.

Example:

If 88 m³ is required then the number of modules to be used can be calculated as follows:

$$88 \div 0.22 = 400$$

400 No. Stormbloc® half blocks should be used.

Configuration options:

Option 1:

16 m x 16 m x 0.360 m (20 half blocks long, 20 half blocks wide, and 1 half block and 1 x base plate deep)

Option 2:

8 m x 16 m x 0.69 m (10 half blocks long, 20 half blocks wide, and 2 half blocks and 1 x base plate deep)

4.2 Pipe adaptors

Stormbloc® blocks should always be orientated so that the side with support columns flush with the edge of the block are on the outside edge of the tank. This will prevent the membrane from pulling into the tank. Where pipe connections are required adaptors are provided depending on the size of pipe used.



Figure 4 - Stormbloc® showing inside and outside edges.

Stormbloc® Connection Adaptors DN150, DN225 and DN300/450 are available for a direct connection to a Stormbloc® Extra block with a side plate or a Stormbloc® Inspect within the tank. Pipes cannot directly connect to Stormbloc® blocks.

The DN300/450 step adaptor simply replaces the side plate on the Stormbloc® Extra block where a pipe connection needs to be made.

Smaller adaptors for DN150 and DN225 attach to the side plate itself. The adaptors can be fitted into any of the four quadrants to suit the level of the incoming pipe. These adaptors attach to the Stormbloc® Extra side plate itself.



Figure 5 - Stormbloc® Extra DN300/450 pipe adaptor.

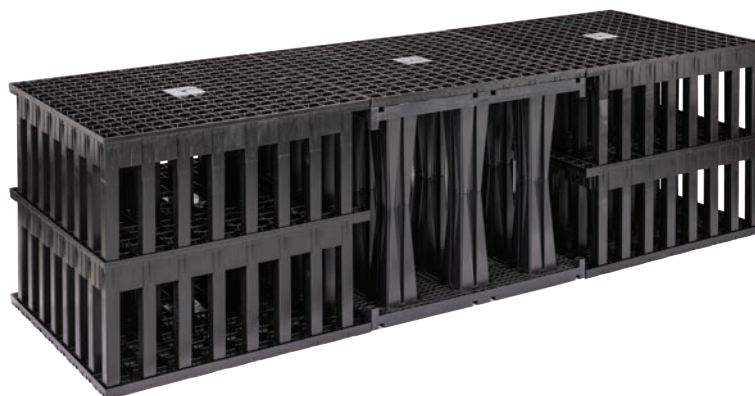


Figure 6 - a row of Stormbloc® with a Stormbloc® Extra in the centre to facilitate a pipe connection



Figure 7 - DN150 pipe adaptor



Figure 8 - DN225 pipe adaptor

4.3 Stormbloc® Inspect modules

The Stormbloc® Inspect offers an unrivalled level of accessibility to any Stormbloc® installation. This modular access chamber, can be installed within a Stormbloc® Extra row inserted in the Stormbloc® tank to facilitate access for CCTV and cleaning. It has identical dimensions to a Stormbloc® Extra module and so can be easily incorporated into the layout of the infiltration or storage system.

Each Stormbloc® Inspect module offers an integrated cutting matrix which makes it possible to have direct access to the inspection tunnels on the Stormbloc® Extra modules for connection of inlet and outlet pipes to the system at any point.

Advantages:

- Option to include a sand trap to catch and collect sediment which can then be easily removed during maintenance.
- Same dimensions as the Stormbloc® Extra modules.
- Can be integrated within all Stormbloc® installations.
- The volume of Stormbloc® Inspect contributes to the required storage capacity.
- High and low level inlet connections possible.
- Can accept inlet / outlet connections up to 450 mm internal diameter.
- Enables optimum accessibility for inspection and maintenance.
- Excellent access to the installation via 500 mm internal diameter extension shaft to ground level.
- Reduces the need for separate manhole chambers.
- The use of a standard vented manhole cover in conjunction with the Stormbloc® Inspect unit removes the need for separate ventilation structures.
- Reduces installation time.
- Reduces capital costs on overall project.

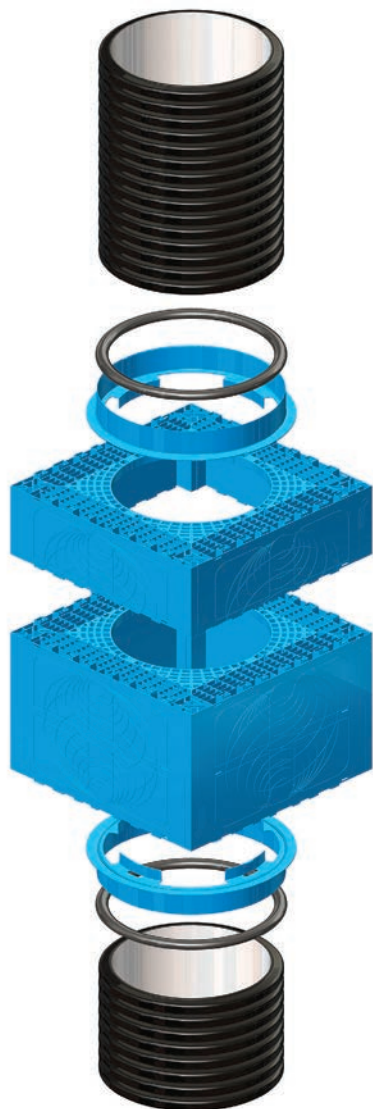


Figure 9 - Stormbloc® Inspect

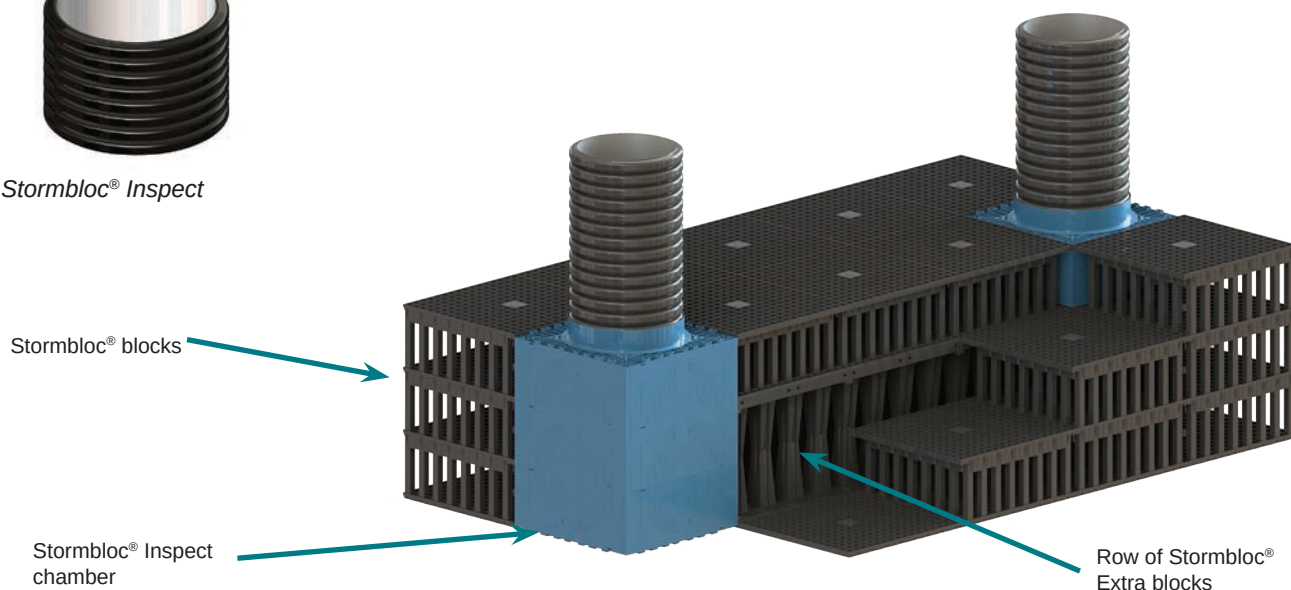


Figure 10 - Stormbloc® tank with Stormbloc® Inspect chamber and Stormbloc® Extra row to give access for CCTV and cleaning.

4.4 Catchpits

The Stormbloc® system is directly accessible for maintenance and inspection via channels formed by Stormbloc® Extra blocks. Access to these tunnels should be provided from a suitable location on the surface, such as via access chambers, manholes, rodding points or Stormbloc® Inspect chambers.

Traditional catchpits or silt traps are not very effective at preventing finer particles from entering any system and any trapped material can often be re-entrained during subsequent storm events and passed into the infiltration or storage media. It is, however, still good practice to include catchpits / silt traps prior to any infiltration or storage system. Any chambers or manholes immediately upstream of a Stormbloc® installation should preferably be built as catchpits or silt traps to capture larger or settleable material. Our Stormbloc® Inspect chambers have the option of including a sand trap, reducing the need for catchpits or silt traps ahead of the system.

If required a complete treatment train approach can be provided with the use of the **Downstream Defender® Select**, **Up-Flo™ Filter** and **Hydro Biofilter™** products which remove a wide range of pollutants including floatable debris, sediments, nutrients, metals, oils, grease organics and bacteria (see below).



Figure 11 - An example of a Stormwater Management System.

4.5 Inlet, outlet and vent pipe requirements

The size and number of pipes being connected to the system should be sufficient to be able to convey the maximum expected flow rates from the site into the modules without restriction. Typically the inlet pipes (and outlet pipes for an on-line storage system) will be connected to the lower tunnel on the modules and a vent pipe will be connected to the upper tunnel.

A vent allows displaced air to escape the Stormbloc® system. Adequate venting must be provided to the Stormbloc® structure, either through high level pipe connections between the units, through direct venting to the atmosphere or via Stormbloc® Inspect chambers which render separate venting systems unnecessary provided ventilated covers are used.

If the system does not include a Stormbloc® Inspect Chamber or high level pipe, a ventilation plate is available for this purpose. As a general rule of thumb the number of 100 mm diameter vent pipes required should equal the number of inlet pipes entering the Stormbloc® system.

4.6 Geotextile and membrane protection

Depending upon the application, the entire system should be wrapped with either a suitable geotextile (for infiltration) or an impermeable membrane (for storage / attenuation). There is a great degree of variation in the physical properties of available geotextiles and membranes, which should be selected according to specific site conditions.

For installations where there is a risk of contaminants within the surrounding ground or where the groundwater level is above the base of the system advice on suitable membrane with welded joints should be sought from a specialist supplier (please contact Hydro International directly if you require a list of independent membrane specialists who have previous experience of Stormbloc® installations).

5. Maintenance instructions

Where Stormbloc® Inspect and Stormbloc® Extra are included, the tank can be inspected via CCTV camera and flushed through.

A catchpit chamber immediately upstream of the system is recommended as this will reduce the amount of silt entering the installation. For larger installations it may also be advantageous to add further catchpits to the system design or an advanced vortex silt trap such as the **Downstream Defender® Select** by Hydro International. The collection sump(s) should not be allowed to overfill as this will lead to silt carry-over into the Stormbloc® modules.

As all schemes are different, the frequency at which the catchpit(s) should be emptied will need to be determined on site. For small soakaways and individual infiltration tanks it will generally only be necessary to ensure that the catchpits / silt traps are free from debris such as leaves or sediment. It is recommended that any system be inspected no less frequently than at monthly intervals for the first 3 months and thereafter at 6 monthly intervals. In addition, it is suggested that the installation is inspected immediately following the first storm event, whenever this should occur post installation.

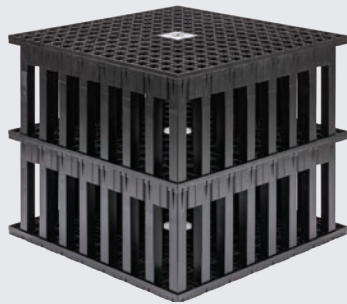
Individual maintenance schedules should be drawn up using the information obtained from the initial inspections. It should also be noted that more regular inspections may be required should the catchpit(s) fill more frequently and/or if the initial inspections reveal that maintenance / cleaning will be required more regularly than at six month intervals.

Flushing of the system can be achieved using a jetting system with a 120 bar pressure. The jet nozzle should be introduced to the system via the access chamber / manhole and the block channel. The silt should be flushed to the access chamber or catchpit manhole and removed from there.



Figure 12 - Jetting nozzle flushing the system

The Stormbloc® Optimum range



Stormbloc®



Stormbloc® Extra

	Stormbloc®		Stormbloc® Extra	
Application suitability	Lighter loaded areas, such as landscaped or low traffic areas (cars ≤ 2.5t)		Heavy loaded area and High-traffic areas such as car parks, roads and warehouse yards.	
Maximum installation depth	3 m		4 m	
Cover depth	Landscaped area, no traffic	Light traffic loading ≤ 2.5 t	Landscaped area, no traffic	Roads & HGV loading yards with traffic loading ≤ 44 t
	0.5 m	0.8 m	0.4 m	0.8 m
Material	Polypropylene		Polypropylene	
	Half block		Full block	Half block
Length / Width / Height	800 / 800 / 330 mm (Note: for the bottom layer add 30 mm for the base plate)		800 / 800 / 660 mm	800 / 800 / 360 mm
Nominal block volume	0.230 m³		0.422 m³	0.230 m³
Nominal storage capacity per unit	0.220 m³		0.405 m³	0.221 m³
Constructed weight	10 kg (1 element and 1 baseplate)		18.6 kg	13.7 kg
Porosity	96%		96 %	96%
Vertical ultimate compressive strength	313 kN/m²		420 kN/m²	420 kN/m²
Horizontal ultimate compressive strength	93 kN/m²		65 kN/m²	225 kN/m²

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Stormbloc® Design Data A/0423