

**Land to the west of New Barn Lane,
North Bersted
West Sussex**

Foul & Surface Water Statement

KTG/18:0047A/5529
9th July 2018

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- 1.1 Linden Homes is seeking planning permission for the development of 37,200m² (3.72ha) of greenfield land located at New Barn Lane, North Bersted, Bognor Regis. The site is centred on National Grid Reference SU 91570 01054.
- 1.2 MJA Consulting has been appointed to prepare a suitable strategy for the disposal of surface and foul water from the proposed development incorporating the principles of Sustainable Drainage Systems (SuDS) and in accordance with Environment Agency guidance, The Building Regulations (Document H 2002) and The National Planning Policy Framework (NPPF).

Surface Water

- 2.1 The National Planning Policy Framework (NPPF) requires that developments do not exacerbate flood risks both to the development site and to offsite parties and land, which means there is a need to manage surface water to ensure there are no increases in peak rates and volumes of runoff as a result of the development.
- 2.2 Environment Agency guidance and government legislation such as the Flood and Water Management Act (Defra 2010) requires surface water drainage strategies for new developments to be in accordance with the ideals of 'sustainable development' via the provision of Sustainable Drainage Systems (SuDS).
- 2.3 The Building Regulations Document H (2015) and The SuDS Manual CIRIA 753 (2015) details the appropriate hierarchy of potential methods for disposing of surface water from a development:
1. A soakaway or some other adequate infiltration system, or where that is not practicable;
 2. A watercourse, or where that is not practicable;
 3. A sewer.
- 2.4 Information published by the British Geological Society (BGS) indicates that the site is anticipated to be directly underlain by the River Terrace Deposits (sand, silt and clays) overlying the Lewis Nodular Chalk Formation (chalk).

- 2.5 Onsite soakage tests using the BRE Digest 365 methodology showed the minimum infiltration rate to be 1×10^{-6} m/s. This is a very poor rate and therefore infiltration SuDs are deemed unsuitable to manage the storm water run-off from the proposed on site development.
- 2.6 It is proposed that surface water runoff from roofs, driveways and roads will be collected by a conventional system of guttering, downpipes and drains where it will be discharged via a surface water pipe network to either an attenuation basin/swale or attenuation tank.
- 2.7 Surface water flows will be attenuated on site with a restricted discharge rate of circa 13 l/s to match the existing greenfield rate. There will be two discharge points taking surface water offsite: The attenuation tank to the north will discharge at 5 l/s to an existing watercourse; and the attenuation tank the south will discharge to a Southern Water existing sewer in New Barn Lane at 8 l/s. The storm water attenuated in the tank to the south will first pass through an attenuation basin/swale which will discharge water to the attenuation tank at 1 l/s.
- 2.8 All SUDS are sized to manage the 1 in 100year (1% AEP) storm event, plus an extra allowance of 40% for the predicted potential increase in peak rainfall up to 2115.
- 2.9 The proposed surface water drainage strategy offers a sustainable, safe and robust system which will afford complete flood risk protection to the new property and to existing properties and land within adjacent to the site. This is achieved by attenuating all additional runoff from impermeable surfaces, incorporating the principles of a Sustainable Drainage System (SuDS).
This strategy ensures that the peak rate and volume of surface water runoff will be no greater than the existing runoff rate for the site for all rainfall events up to the 100 year +40% rainfall event.
- 2.10 The procedure for surface water management in accordance within 'Rainfall runoff management for developments' (DEFRA/EA Report – SC030219 E, 2013) states;
For the range of annual flow rate probabilities up to and including the 1% (1 in 100 year) annual exceedance probability event including an appropriate allowance for climate change, the post-developed rate and volume of run-off into a watercourse, sewer, or other receiving water body, should be no greater than the existing pre-developed rate of run-off for the same event.

Foul Water

- 3.1 The foul water discharge from the development will drain via gravity to an existing public sewer system located beyond the east of the site boundary, within New Barn Lane. Within the site boundary there is a pumping station which will serve a number of the properties in order to connect to the foul drainage network.
- 3.2 The development foul water network will be offered to Southern Water for adoption under a Section 104 agreement of the Water Industry Act 1991.
- 3.3 Southern Water will be consulted to ensure adequate capacity and determine a suitable point of connection with the existing foul sewer. If required, upgrading works will be carried out to the existing network to enable the proposed connection.
- 3.4 This will ensure that the proposed development has a 'no detriment' impact on the foul sewer system within the village of North Bersted and does not create a flood risk.
- 3.5 The predicted peak foul sewer discharge from the proposed property to the existing foul sewer based on the Sewers for Adoption 7th figure (4000 l/dwelling/day) will be 4.2 l/s.

Statement prepared by

Karl T Gebhart
FOR MJA CONSULTING



Appendix A
Surface Water Attenuation Calculations

KTG/18:0047A/5529

MJA Consulting							Page 1																																																																																																																																																																																																																																																																																	
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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 491 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>3.018</td><td>0.318</td><td>0.0</td><td>5.0</td><td>5.0</td><td>113.2</td><td>O K</td></tr><tr><td>30 min Summer</td><td>3.124</td><td>0.424</td><td>0.0</td><td>5.0</td><td>5.0</td><td>150.9</td><td>O K</td></tr><tr><td>60 min Summer</td><td>3.233</td><td>0.533</td><td>0.0</td><td>5.0</td><td>5.0</td><td>189.4</td><td>O K</td></tr><tr><td>120 min Summer</td><td>3.328</td><td>0.628</td><td>0.0</td><td>5.0</td><td>5.0</td><td>223.4</td><td>O K</td></tr><tr><td>180 min Summer</td><td>3.368</td><td>0.668</td><td>0.0</td><td>5.0</td><td>5.0</td><td>237.6</td><td>O K</td></tr><tr><td>240 min 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30 min Winter	3.180	0.480	0.0	5.0	5.0	170.6	O K
60 min Winter	3.303	0.603	0.0	5.0	5.0	214.3	O K
120 min Winter	3.415	0.715	0.0	5.0	5.0	254.2	O K
180 min Winter	3.465	0.765	0.0	5.0	5.0	272.0	O K
240 min Winter	3.487	0.787	0.0	5.1	5.1	279.9	O K
360 min Winter	3.489	0.789	0.0	5.1	5.1	284.1	O K
480 min Winter	3.491	0.791	0.0	5.1	5.1	281.2	O K
600 min Winter	3.472	0.772	0.0	5.1	5.1	274.7	O K
720 min Winter	3.454	0.754	0.0	5.0	5.0	268.3	O K
960 min Winter	3.418	0.718	0.0	5.0	5.0	255.4	O K
1440 min Winter	3.340	0.640	0.0	5.0	5.0	227.5	O K
2160 min Winter	3.218	0.518	0.0	5.0	5.0	184.1	O K
2880 min Winter	3.074	0.374	0.0	5.0	5.0	133.1	O K
4320 min Winter	2.872	0.172	0.0	5.0	5.0	61.3	O K
5760 min Winter	2.770	0.070	0.0	4.8	4.8	25.1	O K
7200 min Winter	2.739	0.039	0.0	4.2	4.2	13.9	O K
8640 min Winter	2.725	0.025	0.0	3.7	3.7	8.8	O K
10080 min Winter	2.715	0.015	0.0	3.3	3.3	5.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	83.789	0.0	180.3	40			
60 min Winter	53.779	0.0	231.6	68			
120 min Winter	33.337	0.0	287.1	126			
180 min Winter	24.832	0.0	320.9	182			
240 min Winter	20.006	0.0	344.7	240			
360 min Winter	14.796	0.0	380.1	352			
480 min Winter	11.818	0.0	407.4	460			
600 min Winter	9.966	0.0	429.4	556			
720 min Winter	8.665	0.0	448.0	580			
960 min Winter	6.943	0.0	478.6	734			
1440 min Winter	5.071	0.0	524.3	1046			
2160 min Winter	3.696	0.0	573.3	1500			
2880 min Winter	2.949	0.0	609.8	1880			
4320 min Winter	2.142	0.0	664.4	2552			
5760 min Winter	1.705	0.0	704.9	3120			
7200 min Winter	1.427	0.0	737.7	3752			
8640 min Winter	1.235	0.0	766.2	4416			
10080 min Winter	1.093	0.0	791.3	5152			
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MJA Consulting		Page 4
Monarch House Barton Lane OX14 3NB	New Barn Lane Tank 1 (North)	
Date 13/02/2018 File 5529 TANK 1 (NORTH).SRCX	Designed by S.Smith Checked by	
Innovyze Source Control 2017.1.2		

Model Details

Storage is Online Cover Level (m) 4.400

Cellular Storage Structure

Invert Level (m) 2.700 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)
0.000	374.4	374.4	0.801	0.0	436.3
0.800	374.4	436.3			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0108-5000-0825-5000
Design Head (m) 0.825
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 108
Invert Level (m) 2.625
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.825	5.0
Flush-Flo™	0.247	5.0
Kick-Flo®	0.548	4.1
Mean Flow over Head Range	-	4.3

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	3.7	1.200	5.9	3.000	9.1	7.000	13.7
0.200	5.0	1.400	6.4	3.500	9.8	7.500	14.2
0.300	5.0	1.600	6.8	4.000	10.5	8.000	14.6
0.400	4.8	1.800	7.2	4.500	11.1	8.500	15.0
0.500	4.5	2.000	7.6	5.000	11.7	9.000	15.4
0.600	4.3	2.200	7.9	5.500	12.2	9.500	15.9
0.800	4.9	2.400	8.2	6.000	12.7		
1.000	5.5	2.600	8.6	6.500	13.2		

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Monarch House Barton Lane OX14 3NB			New Barn Lane Tank 2 (South)																																																																																																																																																																																																																																																																																				
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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 268 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>3.245</td><td>0.315</td><td>0.0</td><td>8.0</td><td>8.0</td><td>107.0</td><td>○ K</td></tr><tr><td>30 min Summer</td><td>3.348</td><td>0.418</td><td>0.0</td><td>8.0</td><td>8.0</td><td>142.0</td><td>○ K</td></tr><tr><td>60 min Summer</td><td>3.449</td><td>0.519</td><td>0.0</td><td>8.0</td><td>8.0</td><td>176.1</td><td>○ K</td></tr><tr><td>120 min Summer</td><td>3.526</td><td>0.596</td><td>0.0</td><td>8.0</td><td>8.0</td><td>202.3</td><td>○ K</td></tr><tr><td>180 min Summer</td><td>3.547</td><td>0.617</td><td>0.0</td><td>8.0</td><td>8.0</td><td>209.3</td><td>○ K</td></tr><tr><td>240 min Summer</td><td>3.544</td><td>0.614</td><td>0.0</td><td>8.0</td><td>8.0</td><td>208.5</td><td>○ K</td></tr><tr><td>360 min Summer</td><td>3.529</td><td>0.599</td><td>0.0</td><td>8.0</td><td>8.0</td><td>203.1</td><td>○ K</td></tr><tr><td>480 min Summer</td><td>3.510</td><td>0.580</td><td>0.0</td><td>8.0</td><td>8.0</td><td>196.8</td><td>○ K</td></tr><tr><td>600 min Summer</td><td>3.489</td><td>0.559</td><td>0.0</td><td>8.0</td><td>8.0</td><td>189.8</td><td>○ K</td></tr><tr><td>720 min Summer</td><td>3.467</td><td>0.537</td><td>0.0</td><td>8.0</td><td>8.0</td><td>182.3</td><td>○ K</td></tr><tr><td>960 min Summer</td><td>3.418</td><td>0.488</td><td>0.0</td><td>8.0</td><td>8.0</td><td>165.7</td><td>○ K</td></tr><tr><td>1440 min Summer</td><td>3.324</td><td>0.394</td><td>0.0</td><td>8.0</td><td>8.0</td><td>133.7</td><td>○ K</td></tr><tr><td>2160 min Summer</td><td>3.208</td><td>0.278</td><td>0.0</td><td>8.0</td><td>8.0</td><td>94.2</td><td>○ K</td></tr><tr><td>2880 min Summer</td><td>3.123</td><td>0.193</td><td>0.0</td><td>8.0</td><td>8.0</td><td>65.4</td><td>○ K</td></tr><tr><td>4320 min Summer</td><td>3.033</td><td>0.103</td><td>0.0</td><td>7.7</td><td>7.7</td><td>34.9</td><td>○ K</td></tr><tr><td>5760 min Summer</td><td>3.005</td><td>0.075</td><td>0.0</td><td>6.6</td><td>6.6</td><td>25.5</td><td>○ K</td></tr><tr><td>7200 min Summer</td><td>2.990</td><td>0.060</td><td>0.0</td><td>5.7</td><td>5.7</td><td>20.2</td><td>○ K</td></tr><tr><td>8640 min Summer</td><td>2.979</td><td>0.049</td><td>0.0</td><td>4.9</td><td>4.9</td><td>16.7</td><td>○ K</td></tr><tr><td>10080 min Summer</td><td>2.972</td><td>0.042</td><td>0.0</td><td>4.4</td><td>4.4</td><td>14.1</td><td>○ K</td></tr><tr><td>15 min Winter</td><td>3.286</td><td>0.356</td><td>0.0</td><td>8.0</td><td>8.0</td><td>120.9</td><td>○ K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak 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Summer</td><td>5.071</td><td>0.0</td><td>453.5</td><td>884</td></tr><tr><td>2160 min Summer</td><td>3.696</td><td>0.0</td><td>495.8</td><td>1252</td></tr><tr><td>2880 min Summer</td><td>2.949</td><td>0.0</td><td>527.5</td><td>1592</td></tr><tr><td>4320 min Summer</td><td>2.142</td><td>0.0</td><td>574.6</td><td>2252</td></tr><tr><td>5760 min Summer</td><td>1.705</td><td>0.0</td><td>609.8</td><td>2944</td></tr><tr><td>7200 min Summer</td><td>1.427</td><td>0.0</td><td>638.1</td><td>3672</td></tr><tr><td>8640 min Summer</td><td>1.235</td><td>0.0</td><td>662.8</td><td>4408</td></tr><tr><td>10080 min Summer</td><td>1.093</td><td>0.0</td><td>684.5</td><td>5136</td></tr><tr><td>15 min Winter</td><td>124.633</td><td>0.0</td><td>129.8</td><td>25</td></tr></tbody></table>							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	3.245	0.315	0.0	8.0	8.0	107.0	○ K	30 min Summer	3.348	0.418	0.0	8.0	8.0	142.0	○ K	60 min Summer	3.449	0.519	0.0	8.0	8.0	176.1	○ K	120 min Summer	3.526	0.596	0.0	8.0	8.0	202.3	○ K	180 min Summer	3.547	0.617	0.0	8.0	8.0	209.3	○ K	240 min Summer	3.544	0.614	0.0	8.0	8.0	208.5	○ K	360 min Summer	3.529	0.599	0.0	8.0	8.0	203.1	○ K	480 min Summer	3.510	0.580	0.0	8.0	8.0	196.8	○ K	600 min Summer	3.489	0.559	0.0	8.0	8.0	189.8	○ K	720 min Summer	3.467	0.537	0.0	8.0	8.0	182.3	○ K	960 min Summer	3.418	0.488	0.0	8.0	8.0	165.7	○ K	1440 min Summer	3.324	0.394	0.0	8.0	8.0	133.7	○ K	2160 min Summer	3.208	0.278	0.0	8.0	8.0	94.2	○ K	2880 min Summer	3.123	0.193	0.0	8.0	8.0	65.4	○ K	4320 min Summer	3.033	0.103	0.0	7.7	7.7	34.9	○ K	5760 min Summer	3.005	0.075	0.0	6.6	6.6	25.5	○ K	7200 min Summer	2.990	0.060	0.0	5.7	5.7	20.2	○ K	8640 min Summer	2.979	0.049	0.0	4.9	4.9	16.7	○ K	10080 min Summer	2.972	0.042	0.0	4.4	4.4	14.1	○ K	15 min Winter	3.286	0.356	0.0	8.0	8.0	120.9	○ K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	124.633	0.0	116.0	25	30 min Summer	83.789	0.0	156.0	39	60 min Summer	53.779	0.0	200.3	68	120 min Summer	33.337	0.0	248.4	124	180 min Summer	24.832	0.0	277.5	182	240 min Summer	20.006	0.0	298.0	230	360 min Summer	14.706	0.0	328.7	288	480 min Summer	11.818	0.0	352.3	354	600 min Summer	9.966	0.0	371.4	422	720 min Summer	8.665	0.0	387.4	492	960 min Summer	6.943	0.0	413.9	626	1440 min Summer	5.071	0.0	453.5	884	2160 min Summer	3.696	0.0	495.8	1252	2880 min Summer	2.949	0.0	527.5	1592	4320 min Summer	2.142	0.0	574.6	2252	5760 min Summer	1.705	0.0	609.8	2944	7200 min Summer	1.427	0.0	638.1	3672	8640 min Summer	1.235	0.0	662.8	4408	10080 min Summer	1.093	0.0	684.5	5136	15 min Winter	124.633	0.0	129.8	25
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MJA Consulting							Page 2
Monarch House Barton Lane OX14 3NB			New Barn Lane Tank 2 (South)				
Date 13/02/2018 File 5529 TANK 2 (SOUTH).SRCX			Designed by C.Pendle Checked by				
Innovyze			Source Control 2017.1.2				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	3.404	0.474	0.0	8.0	8.0	160.9	O K
60 min Winter	3.519	0.589	0.0	8.0	8.0	199.9	O K
120 min Winter	3.611	0.681	0.0	8.0	8.0	231.1	O K
180 min Winter	3.640	0.710	0.0	8.0	8.0	241.0	O K
240 min Winter	3.643	0.713	0.0	8.0	8.0	241.9	O K
360 min Winter	3.621	0.691	0.0	8.0	8.0	234.4	O K
480 min Winter	3.597	0.667	0.0	8.0	8.0	226.4	O K
600 min Winter	3.569	0.639	0.0	8.0	8.0	216.7	O K
720 min Winter	3.537	0.607	0.0	8.0	8.0	206.1	O K
960 min Winter	3.470	0.540	0.0	8.0	8.0	183.3	O K
1440 min Winter	3.318	0.388	0.0	8.0	8.0	131.7	O K
2160 min Winter	3.147	0.217	0.0	8.0	8.0	73.5	O K
2880 min Winter	3.048	0.118	0.0	7.8	7.8	40.2	O K
4320 min Winter	2.998	0.068	0.0	6.2	6.2	23.1	O K
5760 min Winter	2.980	0.050	0.0	5.0	5.0	16.8	O K
7200 min Winter	2.969	0.039	0.0	4.2	4.2	13.1	O K
8640 min Winter	2.961	0.031	0.0	3.6	3.6	10.4	O K
10080 min Winter	2.955	0.025	0.0	3.2	3.2	8.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	83.789	0.0	174.8	39			
60 min Winter	53.779	0.0	224.4	66			
120 min Winter	33.337	0.0	278.1	122			
180 min Winter	24.832	0.0	310.9	178			
240 min Winter	20.006	0.0	333.9	234			
360 min Winter	14.706	0.0	368.1	304			
480 min Winter	11.818	0.0	394.5	376			
600 min Winter	9.966	0.0	415.8	454			
720 min Winter	8.665	0.0	433.9	532			
960 min Winter	6.943	0.0	463.6	684			
1440 min Winter	5.071	0.0	507.9	948			
2160 min Winter	3.696	0.0	555.4	1296			
2880 min Winter	2.949	0.0	590.8	1592			
4320 min Winter	2.142	0.0	643.6	2248			
5760 min Winter	1.705	0.0	683.0	2944			
7200 min Winter	1.427	0.0	714.6	3672			
8640 min Winter	1.235	0.0	742.3	4408			
10080 min Winter	1.093	0.0	766.7	5136			
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MJA Consulting		Page 4
Monarch House Barton Lane OX14 3NB	New Barn Lane Tank 2 (South)	
Date 13/02/2018 File 5529 TANK 2 (SOUTH).SRCX	Designed by C.Pendle Checked by	
Innovyze Source Control 2017.1.2		

Model Details

Storage is Online Cover Level (m) 4.900

Cellular Storage Structure

Invert Level (m) 2.930 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)
0.000	357.2	357.2	0.801	0.0	417.7
0.800	357.2	417.7			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0134-8000-0800-8000
Design Head (m) 0.800
Design Flow (l/s) 8.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 134
Invert Level (m) 2.878
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

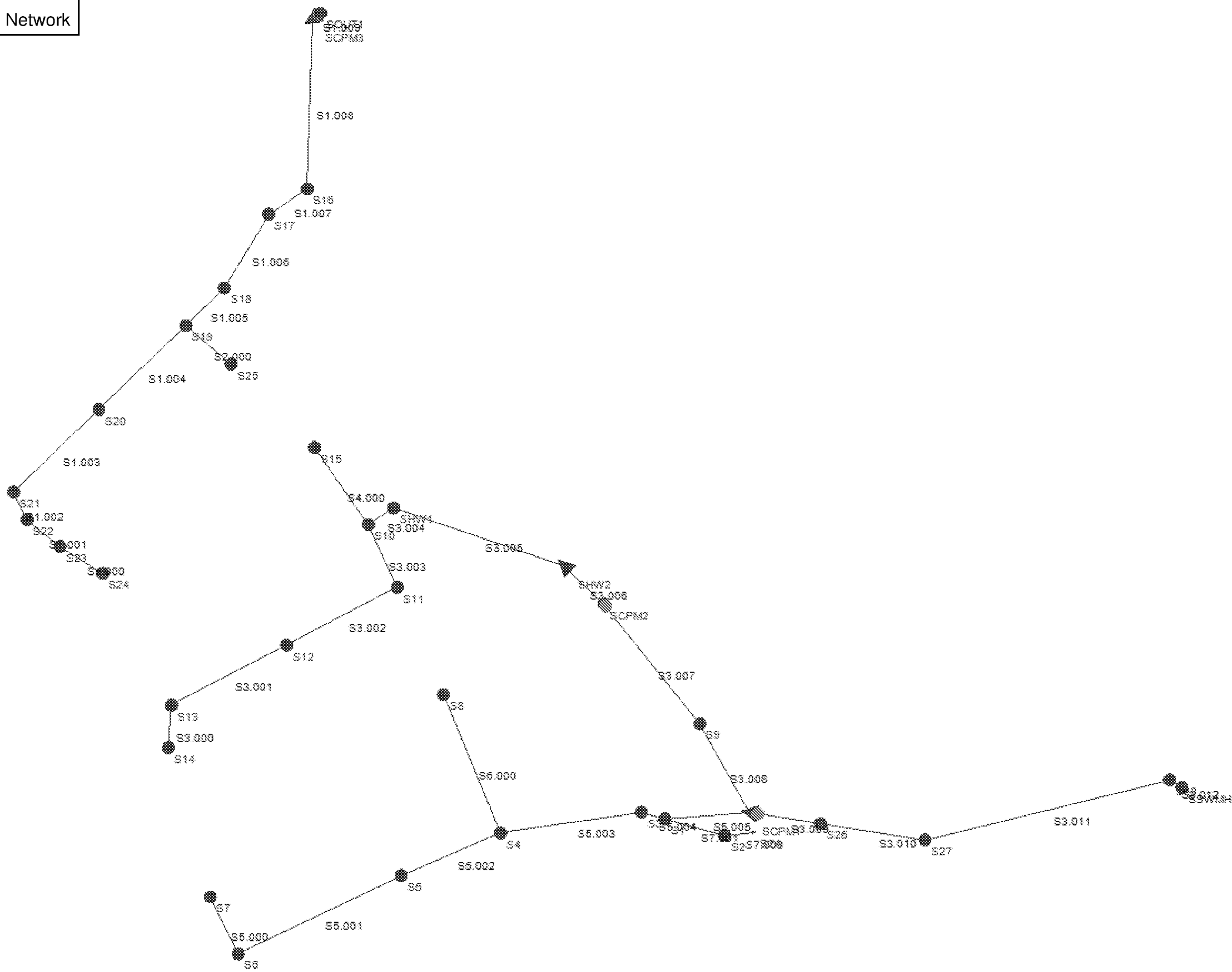
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	8.0
Flush-Flo™	0.252	8.0
Kick-Flo®	0.559	6.8
Mean Flow over Head Range	-	6.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.8	1.200	9.7	3.000	14.9	7.000	22.4
0.200	7.9	1.400	10.4	3.500	16.1	7.500	23.2
0.300	8.0	1.600	11.1	4.000	17.1	8.000	23.9
0.400	7.8	1.800	11.7	4.500	18.1	8.500	24.5
0.500	7.4	2.000	12.3	5.000	19.1	9.000	25.3
0.600	7.0	2.200	12.9	5.500	20.0	9.500	26.0
0.800	8.0	2.400	13.4	6.000	20.8		
1.000	8.9	2.600	14.0	6.500	21.6		

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New Barn Lane
North Bersted
Surface Water Network



MJA Consulting		Page 1
Monarch House Barton Lane OX14 3NB	New Barn Lane, N.Bersted Surface Water Network	
Date 02/07/2018 File SW Network 020718.mdx	Designed by C.Pendle Checked by	
Innovyze	Network 2017.1.2	

Existing Network Details for Storm

* - Indicates pipe has been modified outside of System 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
S1.000	14.272	0.083	172.0	0.049	5.00	0.600	o	225	Pipe/Conduit
S1.001	11.982	0.070	171.2	0.026	0.00	0.600	o	225	Pipe/Conduit
S1.002	8.715	0.051	170.9	0.010	0.00	0.600	o	225	Pipe/Conduit
S1.003	33.571	0.134	250.5	0.105	0.00	0.600	o	300	Pipe/Conduit
S1.004	34.121	0.136	250.9	0.049	0.00	0.600	o	300	Pipe/Conduit
S2.000	16.790	0.113	148.6	0.101	5.00	0.600	o	225	Pipe/Conduit
S1.005	15.204	0.061	249.2	0.008	0.00	0.600	o	300	Pipe/Conduit
S1.006	24.357	0.098	248.5	0.051	0.00	0.600	o	300	Pipe/Conduit
S1.007	13.107	0.076	172.5	0.005	0.00	0.600	o	300	Pipe/Conduit
S1.008	48.058	0.235	204.5	0.056	0.00	0.600	o	300	Pipe/Conduit
S1.009	2.915	0.025	116.6	0.000	0.00	0.600	o	300	Pipe/Conduit
S3.000	12.033	0.070	171.9	0.039	5.00	0.600	o	225	Pipe/Conduit
S3.001	36.708	0.146	251.4	0.070	0.00	0.600	o	300	Pipe/Conduit
S3.002	35.335	0.142	248.8	0.047	0.00	0.600	o	300	Pipe/Conduit
S3.003	19.513	0.078	250.2	0.055	0.00	0.600	o	300	Pipe/Conduit
S4.000	26.630	0.156	170.7	0.089	5.00	0.600	o	225	Pipe/Conduit

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
S1.000	24	5.156	3.644	1.287	5.056	3.561	1.270		1200
S1.001	23	5.056	3.561	1.270	4.989	3.491	1.273		1200
S1.002	22	4.989	3.491	1.273	4.864	3.440	1.199		1200
S1.003	21	4.864	3.365	1.199	4.722	3.231	1.191		1200
S1.004	20	4.722	3.231	1.191	4.489	3.095	1.094		1200
S2.000	25	4.641	3.283	1.133	4.489	3.170	1.094		1200
S1.005	19	4.489	3.095	1.094	4.389	3.034	1.055		1200
S1.006	18	4.389	3.034	1.055	4.300	2.936	1.064		1200
S1.007	17	4.300	2.936	1.064	4.500	2.860	1.340		1200
S1.008	16	4.500	2.860	1.340	4.000	2.625	1.075		1200
S1.009	CPM3	4.000	2.625	1.075	4.000	2.600	1.100	Hydro-Brake®	1200
S3.000	14	5.393	4.250	0.918	5.410	4.180	1.005		1200
S3.001	13	5.410	4.105	1.005	5.160	3.959	0.901		1200
S3.002	12	5.160	3.959	0.901	5.323	3.817	1.206		1200
S3.003	11	5.323	3.817	1.206	5.000	3.739	0.961		1200
S4.000	15	4.950	3.970	0.755	5.000	3.814	0.961		1200

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Monarch House Barton Lane OX14 3NB	New Barn Lane, N.Bersted Surface Water Network	
Date 02/07/2018 File SW Network 020718.mdx	Designed by C.Pendle Checked by	
Innovyze	Network 2017.1.2	

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
* S3.004	8.494	0.024	353.9	0.000	0.00	0.600	o	300	Pipe/Conduit
S3.005	50.847	0.168	302.7	0.000	0.00	0.600	o	300	Pipe/Conduit
S3.006	15.756	0.110	143.2	0.000	0.00	0.600	o	300	Pipe/Conduit
S3.007	43.316	0.260	166.6	0.000	0.00	0.600	o	300	Pipe/Conduit
S3.008	28.700	0.249	115.3	0.000	0.00	0.600	o	300	Pipe/Conduit
S5.000	17.925	0.105	170.7	0.035	5.00	0.600	o	225	Pipe/Conduit
S5.001	51.183	0.204	250.9	0.036	0.00	0.600	o	300	Pipe/Conduit
S5.002	30.537	0.118	258.8	0.091	0.00	0.600	o	300	Pipe/Conduit
S6.000	42.349	0.250	169.4	0.086	5.00	0.600	o	225	Pipe/Conduit
S5.003	40.263	0.161	250.1	0.100	0.00	0.600	o	300	Pipe/Conduit
S5.004	6.842	0.027	253.4	0.060	0.00	0.600	o	300	Pipe/Conduit
S7.000	8.367	0.052	160.9	0.025	5.00	0.600	o	225	Pipe/Conduit
S7.001	17.538	0.103	170.3	0.026	0.00	0.600	o	225	Pipe/Conduit
S5.005	23.908	0.400	59.8	0.000	0.00	0.600	o	300	Pipe/Conduit
PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
* S3.004	10	5.000	3.739	0.961	5.000	3.715	0.985		1200
S3.005	HW1	5.000	3.715	0.985	5.150	3.547	1.303		600
S3.006	HW2	5.150	3.547	1.303	5.150	3.437	1.413		600
S3.007	CPM2	5.150	3.437	1.413	5.000	3.177	1.523	Hydro-Brake®	1500
S3.008	9	5.000	3.177	1.523	4.750	2.928	1.522		1200
S5.000	7	5.150	4.018	0.907	5.039	3.913	0.901		1200
S5.001	6	5.039	3.838	0.901	4.883	3.634	0.949		1200
S5.002	5	4.883	3.634	0.949	4.781	3.516	0.965		1200
S6.000	8	5.150	3.841	1.084	4.781	3.591	0.965		1200
S5.003	4	4.781	3.516	0.965	4.848	3.355	1.193		1200
S5.004	3	4.848	3.355	1.193	4.934	3.328	1.306		1200
S7.000	2A	4.546	3.558	0.763	4.640	3.506	0.909		975 x 675
S7.001	2	4.640	3.506	0.909	4.934	3.403	1.306		1200
S5.005	1	4.934	3.328	1.306	4.750	2.928	1.522		1200
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Monarch House Barton Lane OX14 3NB	New Barn Lane, N.Bersted Surface Water Network	
Date 02/07/2018 File SW Network 020718.mdx	Designed by C.Pendle Checked by	
Innovyze	Network 2017.1.2	

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
* S3.009	20.441	0.082	249.3	0.000	0.00	0.600	o	300	Pipe/Conduit
* S3.010	29.931	0.125	239.4	0.000	0.00	0.600	o	450	Pipe/Conduit
* S3.011	71.169	0.301	236.4	0.000	0.00	0.600	o	450	Pipe/Conduit
* S3.012	4.107	0.020	205.4	0.000	0.00	0.600	o	450	Pipe/Conduit

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
* S3.009	CPM1	4.750	2.878	1.572	4.229	2.796	1.133	Hydro-Brake®	1200
* S3.010	26	4.229	2.796	0.983	4.210	2.671	1.089		1500
* S3.011	27	4.210	2.671	1.089	3.850	2.370	1.030		1500
* S3.012	28	3.850	2.370	1.030	3.730	2.350	0.930		1500

MJA Consulting						Page 4					
Monarch House Barton Lane OX14 3NB				New Barn Lane, N.Bersted Surface Water Network							
Date 02/07/2018 File SW Network 020718.mdx		Designed by C.Pendle Checked by									
Innovyze				Network 2017.1.2							
<u>Manhole Schedules for Storm</u>											
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S24	5.156	1.512	Open Manhole	1200	S1.000	3.644	225				
S23	5.056	1.495	Open Manhole	1200	S1.001	3.561	225	S1.000	3.561	225	
S22	4.989	1.498	Open Manhole	1200	S1.002	3.491	225	S1.001	3.491	225	
S21	4.864	1.499	Open Manhole	1200	S1.003	3.365	300	S1.002	3.440	225	
S20	4.722	1.491	Open Manhole	1200	S1.004	3.231	300	S1.003	3.231	300	
S25	4.641	1.358	Open Manhole	1200	S2.000	3.283	225				
S19	4.489	1.394	Open Manhole	1200	S1.005	3.095	300	S1.004	3.095	300	
								S2.000	3.170	225	
S18	4.389	1.355	Open Manhole	1200	S1.006	3.034	300	S1.005	3.034	300	
S17	4.300	1.364	Open Manhole	1200	S1.007	2.936	300	S1.006	2.936	300	
S16	4.500	1.640	Open Manhole	1200	S1.008	2.860	300	S1.007	2.860	300	
SCPM3	4.000	1.375	Open Manhole	1200	S1.009	2.625	300	S1.008	2.625	300	
SOUT1	4.000	1.400	Open Manhole	600		OUTFALL		S1.009	2.600	300	
S14	5.393	1.143	Open Manhole	1200	S3.000	4.250	225				
S13	5.410	1.305	Open Manhole	1200	S3.001	4.105	300	S3.000	4.180	225	
S12	5.160	1.201	Open Manhole	1200	S3.002	3.959	300	S3.001	3.959	300	
S11	5.323	1.506	Open Manhole	1200	S3.003	3.817	300	S3.002	3.817	300	
S15	4.950	0.980	Open Manhole	1200	S4.000	3.970	225				
S10	5.000	1.261	Open Manhole	1200	S3.004	3.739	300	S3.003	3.739	300	
								S4.000	3.814	225	
SHW1	5.000	1.285	Open Manhole	600	S3.005	3.715	300	S3.004	3.715	300	
SHW2	5.150	1.603	Open Manhole	600	S3.006	3.547	300	S3.005	3.547	300	
SCPM2	5.150	1.713	Open Manhole	1500	S3.007	3.437	300	S3.006	3.437	300	
S9	5.000	1.823	Open Manhole	1200	S3.008	3.177	300	S3.007	3.177	300	
S7	5.150	1.132	Open Manhole	1200	S5.000	4.018	225				
S6	5.039	1.201	Open Manhole	1200	S5.001	3.838	300	S5.000	3.913	225	
S5	4.883	1.249	Open Manhole	1200	S5.002	3.634	300	S5.001	3.634	300	
S8	5.150	1.309	Open Manhole	1200	S6.000	3.841	225				
S4	4.781	1.265	Open Manhole	1200	S5.003	3.516	300	S5.002	3.516	300	
								S6.000	3.591	225	
S3	4.848	1.493	Open Manhole	1200	S5.004	3.355	300	S5.003	3.355	300	
S2A	4.546	0.988	Open Manhole	975 x 675	S7.000	3.558	225				
S2	4.640	1.134	Open Manhole	1200	S7.001	3.506	225	S7.000	3.506	225	
S1	4.934	1.606	Open Manhole	1200	S5.005	3.328	300	S5.004	3.328	300	
								S7.001	3.403	225	
SCPM1	4.750	1.872	Open Manhole	1200	S3.009	2.878	300	S3.008	2.928	300	50
								S5.005	2.928	300	50
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Monarch House Barton Lane OX14 3NB	New Barn Lane, N.Bersted Surface Water Network	
Date 02/07/2018 File SW Network 020718.mdx	Designed by C.Pendle Checked by	
Innovyze	Network 2017.1.2	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S26	4.229	1.433	Open Manhole	1500	S3.010	2.796	450	S3.009	2.796	300	
S27	4.210	1.539	Open Manhole	1500	S3.011	2.671	450	S3.010	2.671	450	
S28	3.850	1.480	Open Manhole	1500	S3.012	2.370	450	S3.011	2.370	450	
SSWMH	3.730	1.380	Open Manhole	1200		OUTFALL		S3.012	2.350	450	

MJA Consulting		Page 6
Monarch House Barton Lane OX14 3NB	New Barn Lane, N.Bersted Surface Water Network	
Date 02/07/2018 File SW Network 020718.mdx	Designed by C.Pendle Checked by	
Innovyze	Network 2017.1.2	

PIPELINE SCHEDULES for Storm

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)
S1.000	o	225	S24	5.156	3.644	1.287	Open Manhole	1200
S1.001	o	225	S23	5.056	3.561	1.270	Open Manhole	1200
S1.002	o	225	S22	4.989	3.491	1.273	Open Manhole	1200
S1.003	o	300	S21	4.864	3.365	1.199	Open Manhole	1200
S1.004	o	300	S20	4.722	3.231	1.191	Open Manhole	1200
S2.000	o	225	S25	4.641	3.283	1.133	Open Manhole	1200
S1.005	o	300	S19	4.489	3.095	1.094	Open Manhole	1200
S1.006	o	300	S18	4.389	3.034	1.055	Open Manhole	1200
S1.007	o	300	S17	4.300	2.936	1.064	Open Manhole	1200
S1.008	o	300	S16	4.500	2.860	1.340	Open Manhole	1200
S1.009	o	300	SCPM3	4.000	2.625	1.075	Open Manhole	1200
S3.000	o	225	S14	5.399	4.250	0.918	Open Manhole	1200
S3.001	o	300	S13	5.410	4.105	1.005	Open Manhole	1200
S3.002	o	300	S12	5.160	3.959	0.901	Open Manhole	1200
S3.003	o	300	S11	5.323	3.817	1.206	Open Manhole	1200
S4.000	o	225	S15	4.950	3.970	0.755	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)
S1.000	14.272	172.0	S23	5.056	3.561	1.270	Open Manhole	1200
S1.001	11.982	171.2	S22	4.989	3.491	1.273	Open Manhole	1200
S1.002	8.715	170.9	S21	4.864	3.440	1.199	Open Manhole	1200
S1.003	33.571	250.5	S20	4.722	3.231	1.191	Open Manhole	1200
S1.004	34.121	250.9	S19	4.489	3.095	1.094	Open Manhole	1200
S2.000	16.790	148.6	S19	4.489	3.170	1.094	Open Manhole	1200
S1.005	15.204	249.2	S18	4.389	3.034	1.055	Open Manhole	1200
S1.006	24.357	248.5	S17	4.300	2.936	1.064	Open Manhole	1200
S1.007	13.107	172.5	S16	4.500	2.860	1.340	Open Manhole	1200
S1.008	48.058	204.5	SCPM3	4.000	2.625	1.075	Open Manhole	1200
S1.009	2.915	116.6	SOUT1	4.000	2.600	1.100	Open Manhole	600
S3.000	12.033	171.9	S13	5.410	4.180	1.005	Open Manhole	1200
S3.001	36.708	251.4	S12	5.160	3.959	0.901	Open Manhole	1200
S3.002	35.335	248.8	S11	5.323	3.817	1.206	Open Manhole	1200
S3.003	19.513	250.2	S10	5.000	3.739	0.961	Open Manhole	1200
S4.000	26.630	170.7	S10	5.000	3.814	0.961	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

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)
S3.004	o	300	S10	5.000	3.739	0.961	Open Manhole	1200
S3.005	o	300	SHW1	5.000	3.715	0.985	Open Manhole	600
S3.006	o	300	SHW2	5.150	3.547	1.303	Open Manhole	600
S3.007	o	300	SCPM2	5.150	3.437	1.413	Open Manhole	1500
S3.008	o	300	S9	5.000	3.177	1.523	Open Manhole	1200
S5.000	o	225	S7	5.150	4.018	0.907	Open Manhole	1200
S5.001	o	300	S6	5.039	3.838	0.901	Open Manhole	1200
S5.002	o	300	S5	4.883	3.634	0.949	Open Manhole	1200
S6.000	o	225	S8	5.150	3.841	1.084	Open Manhole	1200
S5.003	o	300	S4	4.781	3.516	0.965	Open Manhole	1200
S5.004	o	300	S3	4.848	3.355	1.193	Open Manhole	1200
S7.000	o	225	S2A	4.546	3.558	0.763	Open Manhole	975 x 675
S7.001	o	225	S2	4.640	3.506	0.909	Open Manhole	1200
S5.005	o	300	S1	4.934	3.328	1.306	Open Manhole	1200
S3.009	o	300	SCPM1	4.750	2.878	1.572	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)
S3.004	8.494	353.9	SHW1	5.000	3.715	0.985	Open Manhole	600
S3.005	50.847	302.7	SHW2	5.150	3.547	1.303	Open Manhole	600
S3.006	15.756	143.2	SCPM2	5.150	3.437	1.413	Open Manhole	1500
S3.007	43.316	166.6	S9	5.000	3.177	1.523	Open Manhole	1200
S3.008	28.700	115.3	SCPM1	4.750	2.928	1.522	Open Manhole	1200
S5.000	17.925	170.7	S6	5.039	3.913	0.901	Open Manhole	1200
S5.001	51.183	250.9	S5	4.883	3.634	0.949	Open Manhole	1200
S5.002	30.537	258.8	S4	4.781	3.516	0.965	Open Manhole	1200
S6.000	42.349	169.4	S4	4.781	3.591	0.965	Open Manhole	1200
S5.003	40.263	250.1	S3	4.848	3.355	1.193	Open Manhole	1200
S5.004	6.842	253.4	S1	4.934	3.328	1.306	Open Manhole	1200
S7.000	8.367	160.9	S2	4.640	3.506	0.909	Open Manhole	1200
S7.001	17.538	170.3	S1	4.934	3.403	1.306	Open Manhole	1200
S5.005	23.908	59.8	SCPM1	4.750	2.928	1.522	Open Manhole	1200
S3.009	20.441	249.3	S26	4.229	2.796	1.133	Open Manhole	1500

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PIPELINE SCHEDULES for Storm

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)
S3.010	o	450	S26	4.229	2.796	0.983	Open Manhole	1500
S3.011	o	450	S27	4.210	2.671	1.089	Open Manhole	1500
S3.012	o	450	S28	3.850	2.370	1.030	Open Manhole	1500

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)
S3.010	29.931	239.4	S27	4.210	2.671	1.089	Open Manhole	1500
S3.011	71.169	236.4	S28	3.850	2.370	1.030	Open Manhole	1500
S3.012	4.107	205.4	SSWMH	3.750	2.350	0.930	Open Manhole	1200

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<u>Setting Out Information - True Coordinates (Storm)</u>						
PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
S1.000	S24	1200		491497.849	101064.727	
S1.001	S23	1200		491485.798	101072.375	
S1.002	S22	1200		491476.491	101079.920	
S1.003	S21	1200		491472.662	101087.749	
S1.004	S20	1200		491496.796	101111.085	
S2.000	S25	1200		491534.117	101123.943	
S1.005	S19	1200		491521.319	101134.810	
S1.006	S18	1200		491532.172	101145.458	
S1.007	S17	1200		491544.728	101166.329	
S1.008	S16	1200		491555.712	101173.480	
S1.009	SCPM3	1200		491557.041	101221.520	
S3.000	S14	1200		491516.385	101015.460	
S3.001	S13	1200		491517.297	101027.458	
S3.002	S12	1200		491549.834	101044.453	
S3.003	S11	1200		491581.154	101060.812	
S4.000	S15	1200		491557.726	101100.354	
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<u>Setting Out Information - True Coordinates (Storm)</u>						
PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
S3.004	S10	1200		491573.004	101078.542	
S3.005	SHW1	600		491580.094	101083.220	
S3.006	SHW2	600		491628.282	101066.993	
S3.007	SCPM2	1500		491639.600	101056.032	
S3.008	S9	1200		491666.662	101022.210	
S5.000	S7	1200		491528.267	100973.200	
S5.001	S6	1200		491536.137	100957.095	
S5.002	S5	1200		491582.267	100979.270	
S6.000	S8	1200		491594.221	101030.420	
S5.003	S4	1200		491610.351	100991.263	
S5.004	S3	1200		491650.180	100997.155	
S7.000	S2A	975	675	491681.988	100991.477	
S7.001	S2	1200		491673.666	100990.615	
S5.005	S1	1200		491656.771	100995.320	
S3.009	SCPM1	1200		491680.610	100997.128	
S3.010	S26	1500		491700.791	100993.878	
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Setting Out Information - True Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
S3.011	S27	1500		491730.372	100989.315	
S3.012	S28	1500		491799.479	101006.323	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.009	SOUT1	600		491559.484	101223.110	
S3.012	SSWMH	1200		491802.976	101004.169	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	SOUT1	4.000	2.600	0.000	600	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S3.012	SSWMH	3.730	2.350	0.000	1200	0

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SCPM3, DS/PN: S1.009, Volume (m³): 4.9

Unit Reference MD-SHE-0105-5000-1000-5000
Design Head (m) 1.000
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 105
Invert Level (m) 2.625
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
Mean Flow over Head Range	-	4.3

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	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

Hydro-Brake® Optimum Manhole: SCPM2, DS/PN: S3.007, Volume (m³): 4.1

Unit Reference MD-SHE-0047-1000-1000-1000
Design Head (m) 1.000
Design Flow (l/s) 1.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 47
Invert Level (m) 3.437
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

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Hydro-Brake® Optimum Manhole: SCPM2, DS/PN: S3.007, Volume (m³): 4.1

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0
Flush-Flo™	0.205	0.8
Kick-Flo®	0.415	0.7
Mean Flow over Head Range	-	0.8

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	0.8	1.200	1.1	3.000	1.6	7.000	2.4
0.200	0.8	1.400	1.2	3.500	1.8	7.500	2.5
0.300	0.8	1.600	1.2	4.000	1.9	8.000	2.6
0.400	0.7	1.800	1.3	4.500	2.0	8.500	2.7
0.500	0.7	2.000	1.4	5.000	2.1	9.000	2.7
0.600	0.8	2.200	1.4	5.500	2.2	9.500	2.8
0.800	0.9	2.400	1.5	6.000	2.3		
1.000	1.0	2.600	1.5	6.500	2.3		

Hydro-Brake® Optimum Manhole: SCPM1, DS/PN: S3.009, Volume (m³): 5.7

Unit Reference	MD-SHE-0132-8000-1000-8000
Design Head (m)	1.000
Design Flow (l/s)	8.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	132
Invert Level (m)	2.878
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	8.0
Flush-Flo™	0.302	8.0
Kick-Flo®	0.664	6.6
Mean Flow over Head Range	-	6.9

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	4.7	0.300	8.0	0.500	7.7	0.800	7.2
0.200	7.8	0.400	7.9	0.600	7.2	1.000	8.0

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<u>Hydro-Brake® Optimum Manhole: SCPM1, DS/PN: S3.009, Volume (m³): 5.7</u>							
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.200	8.7	2.400	12.1	5.000	17.1	8.000	21.5
1.400	9.4	2.600	12.6	5.500	17.9	8.500	22.1
1.600	10.0	3.000	13.4	6.000	18.7	9.000	22.7
1.800	10.5	3.500	14.5	6.500	19.4	9.500	23.3
2.000	11.1	4.000	15.4	7.000	20.1		
2.200	11.6	4.500	16.3	7.500	20.8		
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Storage Structures for Storm

Cellular Storage Manhole: SCPM3, DS/PN: S1.009

Invert Level (m) 2.625 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)
0.000	376.0	376.0	0.801	0.0	452.2
0.800	376.0	452.2			

Tank or Pond Manhole: SHW2, DS/PN: S3.006

Invert Level (m) 3.547

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	376.0	0.700	974.0	1.400	1159.0	2.100	1159.0
0.100	457.0	0.800	1065.0	1.500	1159.0	2.200	1159.0
0.200	539.0	0.900	1159.0	1.600	1159.0	2.300	1159.0
0.300	623.0	1.000	1159.0	1.700	1159.0	2.400	1159.0
0.400	708.0	1.100	1159.0	1.800	1159.0	2.500	1159.0
0.500	795.0	1.200	1159.0	1.900	1159.0		
0.600	884.0	1.300	1159.0	2.000	1159.0		

Cellular Storage Manhole: SCPM1, DS/PN: S3.009

Invert Level (m) 2.878 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)
0.000	360.0	360.0	0.801	0.0	433.6
0.800	360.0	433.6			

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<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>							
<u>Simulation Criteria</u>							
Areal Reduction Factor 1.000		Additional Flow - % of Total Flow 0.000					
Hot Start (mins) 0		MADD Factor * 10m³/ha Storage 2.000					
Hot Start Level (mm) 0		Inlet Coeffiecient 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 Storage Structures 3					
Number of Online Controls 3		Number of Time/Area Diagrams 0					
Number of Offline Controls 0		Number of Real Time Controls 0					
<u>Synthetic Rainfall Details</u>							
Rainfall Model		FSR		Ratio R 0.350			
Region England and Wales		Cv (Summer) 0.750					
M5-60 (mm)		19.000		Cv (Winter) 0.840			
Margin for Flood Risk Warning (mm)		300.0					
Analysis Timestep 2.5		Second Increment (Extended)					
DTS Status		ON					
DVD Status		ON					
Inertia Status		ON					
Profile(s)		Summer and Winter					
Duration(s) (mins)		15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880					
Return Period(s) (years)		1, 30, 100					
Climate Change (%)		0, 0, 40					
		US/CL		Water	Flooded	Pipe	
		(m)		Level	Volume	Flow	
PN	Event			(m)	(m³)	(l/s)	Status
S1.000	15 minute 1 year Winter I+0%	5.156	3.708	0.000	6.1	OK	
S1.001	15 minute 1 year Winter I+0%	5.056	3.640	0.000	8.9	OK	
S1.002	15 minute 1 year Winter I+0%	4.989	3.577	0.000	10.0	OK	
S1.003	15 minute 1 year Winter I+0%	4.864	3.483	0.000	20.7	OK	
S1.004	15 minute 1 year Winter I+0%	4.722	3.363	0.000	25.2	OK	
S2.000	15 minute 1 year Winter I+0%	4.641	3.373	0.000	12.5	OK	
S1.005	15 minute 1 year Winter I+0%	4.489	3.267	0.000	36.7	OK	
S1.006	15 minute 1 year Winter I+0%	4.389	3.213	0.000	41.2	OK	
S1.007	15 minute 1 year Winter I+0%	4.300	3.104	0.000	41.3	OK	
S1.008	15 minute 1 year Winter I+0%	4.500	3.034	0.000	45.8	OK	
S1.009	360 minute 1 year Winter I+0%	4.000	2.761	0.000	3.7	OK	
S3.000	15 minute 1 year Winter I+0%	5.393	4.307	0.000	4.9	OK	
S3.001	15 minute 1 year Winter I+0%	5.410	4.195	0.000	12.2	OK	
S3.002	15 minute 1 year Winter I+0%	5.160	4.064	0.000	16.8	OK	
S3.003	15 minute 1 year Winter I+0%	5.323	3.968	0.000	21.5	OK	
S4.000	15 minute 1 year Winter I+0%	4.950	4.055	0.000	11.1	OK	
S3.004	15 minute 1 year Winter I+0%	5.000	3.936	0.000	30.8	OK	
S3.005	15 minute 1 year Winter I+0%	5.000	3.868	0.000	30.9	OK	
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
S3.006	720 minute 1 year Winter I+0%	5.150	3.646	0.000	1.7	OK
S3.007	720 minute 1 year Winter I+0%	5.150	3.649	0.000	0.8	OK
S3.008	2880 minute 1 year Winter I+0%	5.000	3.189	0.000	0.8	OK
S5.000	15 minute 1 year Winter I+0%	5.150	4.071	0.000	4.3	OK
S5.001	15 minute 1 year Winter I+0%	5.039	3.909	0.000	7.9	OK
S5.002	15 minute 1 year Winter I+0%	4.883	3.742	0.000	17.0	OK
S6.000	15 minute 1 year Winter I+0%	5.150	3.923	0.000	10.6	OK
S5.003	15 minute 1 year Winter I+0%	4.781	3.679	0.000	36.5	OK
S5.004	15 minute 1 year Winter I+0%	4.848	3.566	0.000	41.7	OK
S7.000	15 minute 1 year Winter I+0%	4.546	3.605	0.000	3.1	OK
S7.001	15 minute 1 year Winter I+0%	4.640	3.568	0.000	5.9	OK
S5.005	15 minute 1 year Winter I+0%	4.934	3.453	0.000	46.6	OK
S3.009	240 minute 1 year Winter I+0%	4.750	3.010	0.000	6.4	OK
S3.010	240 minute 1 year Winter I+0%	4.229	2.851	0.000	6.4	OK
S3.011	240 minute 1 year Winter I+0%	4.210	2.724	0.000	6.4	OK
S3.012	240 minute 1 year Winter I+0%	3.850	2.437	0.000	6.4	OK

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
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 Storage Structures 3
Number of Online Controls 3 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
S1.000	15 minute 30 year Winter I+0%	5.156	3.955	0.000	14.8	SURCHARGED
S1.001	15 minute 30 year Winter I+0%	5.056	3.935	0.000	20.9	SURCHARGED
S1.002	15 minute 30 year Winter I+0%	4.989	3.909	0.000	21.8	SURCHARGED
S1.003	15 minute 30 year Winter I+0%	4.864	3.876	0.000	51.1	SURCHARGED
S1.004	15 minute 30 year Winter I+0%	4.722	3.785	0.000	52.2	SURCHARGED
S2.000	15 minute 30 year Winter I+0%	4.641	3.778	0.000	26.5	SURCHARGED
S1.005	15 minute 30 year Winter I+0%	4.489	3.699	0.000	73.5	SURCHARGED
S1.006	15 minute 30 year Winter I+0%	4.389	3.605	0.000	83.5	SURCHARGED
S1.007	15 minute 30 year Winter I+0%	4.300	3.435	0.000	84.2	SURCHARGED
S1.008	15 minute 30 year Winter I+0%	4.500	3.313	0.000	93.6	SURCHARGED
S1.009	240 minute 30 year Winter I+0%	4.000	2.962	0.000	5.0	SURCHARGED
S3.000	15 minute 30 year Winter I+0%	5.393	4.367	0.000	12.0	OK
S3.001	15 minute 30 year Winter I+0%	5.410	4.353	0.000	33.1	OK
S3.002	15 minute 30 year Winter I+0%	5.160	4.307	0.000	36.7	SURCHARGED
S3.003	15 minute 30 year Winter I+0%	5.323	4.221	0.000	47.6	SURCHARGED
S4.000	15 minute 30 year Winter I+0%	4.950	4.218	0.000	24.5	SURCHARGED
S3.004	15 minute 30 year Winter I+0%	5.000	4.139	0.000	70.1	SURCHARGED
S3.005	15 minute 30 year Winter I+0%	5.000	4.040	0.000	69.2	SURCHARGED

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

PN	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
S3.006	960 minute 30 year Winter I+0%	5.150	3.786	0.000	2.2	OK
S3.007	960 minute 30 year Winter I+0%	5.150	3.785	0.000	0.8	SURCHARGED
S3.008	240 minute 30 year Winter I+0%	5.000	3.207	0.000	0.8	OK
S5.000	15 minute 30 year Winter I+0%	5.150	4.119	0.000	10.7	OK
S5.001	15 minute 30 year Winter I+0%	5.039	4.102	0.000	19.2	OK
S5.002	15 minute 30 year Winter I+0%	4.883	4.064	0.000	32.9	SURCHARGED
S6.000	15 minute 30 year Winter I+0%	5.150	4.091	0.000	23.7	SURCHARGED
S5.003	15 minute 30 year Winter I+0%	4.761	3.985	0.000	78.0	SURCHARGED
S5.004	15 minute 30 year Winter I+0%	4.848	3.749	0.000	90.9	SURCHARGED
S7.000	15 minute 30 year Winter I+0%	4.546	3.637	0.000	7.7	OK
S7.001	15 minute 30 year Winter I+0%	4.640	3.613	0.000	16.0	OK
S5.005	15 minute 30 year Winter I+0%	4.934	3.535	0.000	104.4	OK
S3.009	240 minute 30 year Winter I+0%	4.750	3.197	0.000	8.0	SURCHARGED
S3.010	360 minute 30 year Summer I+0%	4.229	2.857	0.000	8.0	OK
S3.011	180 minute 30 year Summer I+0%	4.210	2.729	0.000	8.0	OK
S3.012	360 minute 30 year Summer I+0%	3.850	2.446	0.000	8.0	OK

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
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 Storage Structures 3
Number of Online Controls 3 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	Event	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
S1.000	15 minute 100 year Winter I+40%	5.156	5.138	0.000	22.2	FLOOD RISK
S1.001	15 minute 100 year Winter I+40%	5.056	5.056	0.130	31.7	FLOOD
S1.002	15 minute 100 year Winter I+40%	4.989	4.971	0.000	34.8	FLOOD RISK
S1.003	15 minute 100 year Winter I+40%	4.864	4.845	0.000	66.6	FLOOD
S1.004	15 minute 100 year Winter I+40%	4.722	4.722	0.117	82.5	FLOOD
S2.000	15 minute 100 year Winter I+40%	4.641	4.642	0.666	43.6	FLOOD
S1.005	15 minute 100 year Winter I+40%	4.489	4.494	5.453	114.5	FLOOD
S1.006	15 minute 100 year Summer I+40%	4.389	4.367	0.000	121.0	FLOOD RISK
S1.007	15 minute 100 year Winter I+40%	4.300	4.058	0.000	122.4	FLOOD RISK
S1.008	15 minute 100 year Winter I+40%	4.500	3.845	0.000	139.8	SURCHARGED
S1.009	360 minute 100 year Winter I+40%	4.000	3.334	0.000	5.0	SURCHARGED
S3.000	15 minute 100 year Winter I+40%	5.393	5.162	0.000	16.7	FLOOD RISK
S3.001	15 minute 100 year Winter I+40%	5.410	5.124	0.000	43.8	FLOOD RISK
S3.002	15 minute 100 year Winter I+40%	5.160	5.041	0.000	62.0	FLOOD RISK
S3.003	15 minute 100 year Winter I+40%	5.323	4.904	0.000	83.2	SURCHARGED
S4.000	15 minute 100 year Winter I+40%	4.950	4.842	0.000	39.0	FLOOD RISK
S3.004	15 minute 100 year Winter I+40%	5.000	4.763	0.000	121.7	FLOOD RISK
S3.005	15 minute 100 year Winter I+40%	5.000	4.527	0.000	118.9	SURCHARGED

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

PN	Event			US/CL (m)	Water Level (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
S3.006	1440 minute	100 year	Winter I+40%	5.150	3.977	0.000	2.0	SURCHARGED
S3.007	1440 minute	100 year	Winter I+40%	5.150	3.996	0.000	0.8	SURCHARGED
S3.008	240 minute	100 year	Winter I+40%	5.000	3.555	0.000	1.0	SURCHARGED
S5.000	15 minute	100 year	Winter I+40%	5.150	5.035	0.000	17.2	FLOOD RISK
S5.001	15 minute	100 year	Summer I+40%	5.039	4.978	0.000	26.3	FLOOD RISK
S5.002	15 minute	100 year	Winter I+40%	4.883	4.884	0.944	57.6	FLOOD
S6.000	15 minute	100 year	Winter I+40%	5.150	5.115	0.000	40.1	FLOOD RISK
S5.003	15 minute	100 year	Winter I+40%	4.781	4.783	2.353	128.8	FLOOD
S5.004	15 minute	100 year	Winter I+40%	4.848	4.277	0.000	145.7	SURCHARGED
S7.000	15 minute	100 year	Winter I+40%	4.546	4.021	0.000	12.4	SURCHARGED
S7.001	15 minute	100 year	Winter I+40%	4.640	4.007	0.000	25.2	SURCHARGED
S5.005	15 minute	100 year	Winter I+40%	4.934	3.933	0.000	169.0	SURCHARGED
S3.009	240 minute	100 year	Winter I+40%	4.750	3.554	0.000	8.0	SURCHARGED
S3.010	2160 minute	100 year	Summer I+40%	4.229	2.857	0.000	8.0	OK
S3.011	2160 minute	100 year	Summer I+40%	4.210	2.729	0.000	8.0	OK
S3.012	2160 minute	100 year	Summer I+40%	3.850	2.446	0.000	8.0	OK