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1 Malin Hill Nottingham NG1 1JQ	MA11542 Lowgate Holbeach SWS Design R01	
Date 30/01/2023 08:48 File MA11542-DD-R01.MDX	Designed by JMcK Checked by	
XP Solutions Network 2020.1.3		

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	10
Ratio R	0.412	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	20.000
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 Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.088	4-8	0.312	8-12	0.380	12-16	0.081

Total Area Contributing (ha) = 0.861

Total Pipe Volume (m³) = 68.941

Network Design Table for Storm

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
S1.000	36.388	0.112	324.9	0.119	5.00	0.0	0.600	o	375	Pipe/Conduit	
S1.001	41.114	0.127	323.7	0.063	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.002	19.215	0.060	320.3	0.024	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.003	7.528	0.024	313.7	0.022	0.00	0.0	0.600	o	375	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)
S1.000	0.00	5.61	3.120	0.119	0.0	0.0	0.0	1.00	110.4	0.0
S1.001	0.00	6.29	3.008	0.182	0.0	0.0	0.0	1.00	110.6	0.0
S1.002	0.00	6.61	2.881	0.206	0.0	0.0	0.0	1.01	111.2	0.0
S1.003	0.00	6.73	2.821	0.228	0.0	0.0	0.0	1.02	112.4	0.0

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NG1 1JQ

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MA11542
Lowgate Holbeach
SWS Design R01

Designed by JMcK
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Network Design Table for Storm

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
S4.000	29.016	0.119	243.8	0.051	5.00	0.0	0.600	o	300	Pipe/Conduit	
S4.001	23.053	0.094	245.2	0.037	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.002	23.223	0.095	244.5	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.003	16.682	0.068	245.3	0.021	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.004	33.391	0.137	243.7	0.035	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	5.902	0.024	245.9	0.022	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	28.060	0.115	244.0	0.062	5.00	0.0	0.600	o	300	Pipe/Conduit	
S5.001	9.598	0.039	246.1	0.020	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.002	8.730	0.036	242.5	0.019	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	21.200	0.087	243.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.007	25.261	0.030	842.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.013	11.948	0.049	243.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.014	24.842	0.248	100.0	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)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	0.00	5.48	2.890	0.051	0.0	0.0	0.0	1.00	70.9	0.0
S4.001	0.00	5.87	2.771	0.087	0.0	0.0	0.0	1.00	70.6	0.0
S4.002	0.00	6.25	2.677	0.118	0.0	0.0	0.0	1.00	70.8	0.0
S4.003	0.00	6.53	2.582	0.139	0.0	0.0	0.0	1.00	70.6	0.0
S4.004	0.00	7.09	2.514	0.174	0.0	0.0	0.0	1.00	70.9	0.0
S4.005	0.00	7.19	2.377	0.196	0.0	0.0	0.0	1.00	70.6	0.0
S5.000	0.00	5.47	2.542	0.062	0.0	0.0	0.0	1.00	70.8	0.0
S5.001	0.00	5.63	2.427	0.082	0.0	0.0	0.0	1.00	70.5	0.0
S5.002	0.00	5.77	2.388	0.102	0.0	0.0	0.0	1.01	71.1	0.0
S4.006	0.00	7.54	2.352	0.298	0.0	0.0	0.0	1.00	70.9	0.0
S4.007	0.00	8.33	2.265	0.298	0.0	0.0	0.0	0.53	37.7	0.0
S1.013	0.00	13.77	2.160	0.861	0.0	0.0	0.0	1.16	127.7	0.0
S1.014	0.00	14.18	2.111	0.861	0.0	0.0	0.0	1.00	17.8	0.0

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XP Solutions				Network 2020.1.3						
<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)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
S1	3.700	0.580	Open Manhole	1350	S1.000	3.120	375			
S2	3.700	0.692	Open Manhole	1350	S1.001	3.008	375	S1.000	3.008	375
S3	3.575	0.694	Open Manhole	1350	S1.002	2.881	375	S1.001	2.881	375
S4	3.455	0.634	Open Manhole	1350	S1.003	2.821	375	S1.002	2.821	375
S5	3.500	0.703	Open Manhole	1350	S1.004	2.797	375	S1.003	2.797	375
S6	3.560	0.789	Open Manhole	1350	S1.005	2.771	375	S1.004	2.771	375
S7	3.615	0.870	Open Manhole	1350	S1.006	2.745	375	S1.005	2.745	375
S8	3.700	1.015	Open Manhole	1350	S1.007	2.685	375	S1.006	2.685	375
S9	3.600	0.734	Open Manhole	1350	S2.000	2.866	375			
S10	3.315	0.580	Open Manhole	1350	S2.001	2.735	375	S2.000	2.735	375
S11	3.600	0.974	Open Manhole	1350	S1.008	2.626	375	S1.007	2.626	375
								S2.001	2.626	375
S12	3.200	0.859	Open Manhole	1350	S1.009	2.341	375	S1.008	2.341	375
S13	3.200	0.890	Open Manhole	1350	S1.010	2.310	375	S1.009	2.310	375
S14	3.480	1.252	Open Manhole	1350	S1.011	2.228	375	S1.010	2.228	375
S15	3.200	1.035	Open Manhole	1350	S1.012	2.165	375	S1.011	2.165	375
S16	3.700	0.884	Open Manhole	1200	S3.000	2.816	300			
S17	3.700	1.006	Open Manhole	1200	S3.001	2.694	300	S3.000	2.694	300
S18	3.300	0.741	Open Manhole	1200	S3.002	2.559	300	S3.001	2.559	300
S19	3.300	0.983	Open Manhole	1200	S3.003	2.317	300	S3.002	2.317	300
S20	3.300	1.034	Open Manhole	1200	S3.004	2.266	300	S3.003	2.266	300
S21	3.605	0.715	Open Manhole	1200	S4.000	2.890	300			
S22	3.495	0.724	Open Manhole	1200	S4.001	2.771	300	S4.000	2.771	300
S23	3.495	0.818	Open Manhole	1200	S4.002	2.677	300	S4.001	2.677	300
S24	3.650	1.068	Open Manhole	1200	S4.003	2.582	300	S4.002	2.582	300
S25	3.650	1.136	Open Manhole	1200	S4.004	2.514	300	S4.003	2.514	300
S26	3.430	1.053	Open Manhole	1200	S4.005	2.377	300	S4.004	2.377	300
S27	3.700	1.158	Open Manhole	1200	S5.000	2.542	300			
S28	3.510	1.083	Open Manhole	1200	S5.001	2.427	300	S5.000	2.427	300
S29	3.452	1.064	Open Manhole	1200	S5.002	2.388	300	S5.001	2.388	300
S30	3.390	1.038	Open Manhole	1200	S4.006	2.352	300	S4.005	2.353	300
								S5.002	2.352	300
S31	3.200	0.935	Open Manhole	1200	S4.007	2.265	300	S4.006	2.265	300
S32	3.700	1.540	Open Manhole	1350	S1.013	2.160	375	S1.012	2.160	375
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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S25	539548.778	325878.982	539548.778	325878.982	Required	
S26	539546.543	325845.666	539546.543	325845.666	Required	
S27	539544.696	325793.652	539544.696	325793.652	Required	
S28	539545.517	325821.700	539545.517	325821.700	Required	
S29	539547.525	325831.086	539547.525	325831.086	Required	
S30	539547.300	325839.813	539547.300	325839.813	Required	
S31	539568.305	325842.676	539568.305	325842.676	Required	
S32	539571.037	325867.789	539571.037	325867.789	Required	
S33	539560.461	325873.349	539560.461	325873.349	Required	
S34	539535.622	325873.002			No Entry	

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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)
S1.000	o	375	S1	3.700	3.120	0.205	Open Manhole	1350
S1.001	o	375	S2	3.700	3.008	0.317	Open Manhole	1350
S1.002	o	375	S3	3.575	2.881	0.319	Open Manhole	1350
S1.003	o	375	S4	3.455	2.821	0.259	Open Manhole	1350
S1.004	o	375	S5	3.500	2.797	0.328	Open Manhole	1350
S1.005	o	375	S6	3.560	2.771	0.414	Open Manhole	1350
S1.006	o	375	S7	3.615	2.745	0.495	Open Manhole	1350
S1.007	o	375	S8	3.700	2.685	0.640	Open Manhole	1350
S2.000	o	375	S9	3.600	2.866	0.359	Open Manhole	1350
S2.001	o	375	S10	3.315	2.735	0.205	Open Manhole	1350
S1.008	o	375	S11	3.600	2.626	0.599	Open Manhole	1350
S1.009	o	375	S12	3.200	2.341	0.484	Open Manhole	1350
S1.010	o	375	S13	3.200	2.310	0.515	Open Manhole	1350
S1.011	o	375	S14	3.480	2.228	0.877	Open Manhole	1350
S1.012	o	375	S15	3.200	2.165	0.660	Open Manhole	1350

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	36.388	324.9	S2	3.700	3.008	0.317	Open Manhole	1350
S1.001	41.114	323.7	S3	3.575	2.881	0.319	Open Manhole	1350
S1.002	19.215	320.3	S4	3.455	2.821	0.259	Open Manhole	1350
S1.003	7.528	313.7	S5	3.500	2.797	0.328	Open Manhole	1350
S1.004	8.441	324.7	S6	3.560	2.771	0.414	Open Manhole	1350
S1.005	8.441	324.7	S7	3.615	2.745	0.495	Open Manhole	1350
S1.006	19.192	319.9	S8	3.700	2.685	0.640	Open Manhole	1350
S1.007	19.109	323.9	S11	3.600	2.626	0.599	Open Manhole	1350
S2.000	42.379	323.5	S10	3.315	2.735	0.205	Open Manhole	1350
S2.001	35.118	322.2	S11	3.600	2.626	0.599	Open Manhole	1350
S1.008	23.072	81.0	S12	3.200	2.341	0.484	Open Manhole	1350
S1.009	7.569	244.2	S13	3.200	2.310	0.515	Open Manhole	1350
S1.010	15.121	184.4	S14	3.480	2.228	0.877	Open Manhole	1350
S1.011	20.280	321.9	S15	3.200	2.165	0.660	Open Manhole	1350
S1.012	51.838	10367.6	S32	3.700	2.160	1.165	Open Manhole	1350



Micro
Drainage

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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)
S4.007	o	300	S31	3.200	2.265	0.635	Open Manhole	1200
S1.013	o	375	S32	3.700	2.160	1.165	Open Manhole	1350
S1.014	o	150	S33	3.500	2.111	1.239	Open Manhole	1350

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)
S4.007	25.261	842.0	S32	3.700	2.235	1.165	Open Manhole	1350
S1.013	11.948	243.8	S33	3.500	2.111	1.014	Open Manhole	1350
S1.014	24.842	100.0	S34	3.150	1.863	1.137	Open Manhole	0

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Simulation Criteria for Storm <table><tr><td>Rainfall Model</td><td>FSR</td><td>Profile Type</td><td>Summer</td></tr><tr><td>Return Period (years)</td><td>2</td><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>Region</td><td>England and Wales</td><td>Cv (Winter)</td><td>0.840</td></tr><tr><td>M5-60 (mm)</td><td>19.000</td><td>Storm Duration (mins)</td><td>30</td></tr><tr><td>Ratio R</td><td>0.412</td><td></td><td></td></tr></table>			Rainfall Model	FSR	Profile Type	Summer	Return Period (years)	2	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.000	Storm Duration (mins)	30	Ratio R	0.412		
Rainfall Model	FSR	Profile Type	Summer																			
Return Period (years)	2	Cv (Summer)	0.750																			
Region	England and Wales	Cv (Winter)	0.840																			
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Ratio R	0.412																					
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<u>Online Controls for Storm</u> <u>Hydro-Brake® Optimum Manhole: S33, DS/PN: S1.014, Volume (m³): 3.2</u> <table><tr><td>Unit Reference</td><td>MD-SHE-0100-5000-1389-5000</td></tr><tr><td>Design Head (m)</td><td>1.389</td></tr><tr><td>Design Flow (l/s)</td><td>5.0</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr><tr><td>Objective</td><td>Minimise upstream storage</td></tr><tr><td>Application</td><td>Surface</td></tr><tr><td>Sump Available</td><td>Yes</td></tr><tr><td>Diameter (mm)</td><td>100</td></tr><tr><td>Invert Level (m)</td><td>2.111</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td>150</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td>1200</td></tr></table> <table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>1.389</td><td>5.0</td><td>Kick-Flo®</td><td>0.855</td><td>4.0</td></tr><tr><td>Flush-Flo™</td><td>0.418</td><td>5.0</td><td>Mean Flow over Head Range</td><td>-</td><td>4.4</td></tr></table> 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 <table><tr><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td></tr><tr><td>0.100</td><td>3.3</td><td>1.200</td><td>4.7</td><td>3.000</td><td>7.2</td><td>7.000</td><td>10.7</td></tr><tr><td>0.200</td><td>4.6</td><td>1.400</td><td>5.0</td><td>3.500</td><td>7.7</td><td>7.500</td><td>11.1</td></tr><tr><td>0.300</td><td>4.9</td><td>1.600</td><td>5.3</td><td>4.000</td><td>8.2</td><td>8.000</td><td>11.4</td></tr><tr><td>0.400</td><td>5.0</td><td>1.800</td><td>5.6</td><td>4.500</td><td>8.7</td><td>8.500</td><td>11.7</td></tr><tr><td>0.500</td><td>5.0</td><td>2.000</td><td>5.9</td><td>5.000</td><td>9.1</td><td>9.000</td><td>12.1</td></tr><tr><td>0.600</td><td>4.9</td><td>2.200</td><td>6.2</td><td>5.500</td><td>9.5</td><td>9.500</td><td>12.4</td></tr><tr><td>0.800</td><td>4.3</td><td>2.400</td><td>6.4</td><td>6.000</td><td>9.9</td><td></td><td></td></tr><tr><td>1.000</td><td>4.3</td><td>2.600</td><td>6.7</td><td>6.500</td><td>10.3</td><td></td><td></td></tr></table>					Unit Reference	MD-SHE-0100-5000-1389-5000	Design Head (m)	1.389	Design Flow (l/s)	5.0	Flush-Flo™	Calculated	Objective	Minimise upstream storage	Application	Surface	Sump Available	Yes	Diameter (mm)	100	Invert Level (m)	2.111	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)	1.389	5.0	Kick-Flo®	0.855	4.0	Flush-Flo™	0.418	5.0	Mean Flow over Head Range	-	4.4	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	3.3	1.200	4.7	3.000	7.2	7.000	10.7	0.200	4.6	1.400	5.0	3.500	7.7	7.500	11.1	0.300	4.9	1.600	5.3	4.000	8.2	8.000	11.4	0.400	5.0	1.800	5.6	4.500	8.7	8.500	11.7	0.500	5.0	2.000	5.9	5.000	9.1	9.000	12.1	0.600	4.9	2.200	6.2	5.500	9.5	9.500	12.4	0.800	4.3	2.400	6.4	6.000	9.9			1.000	4.3	2.600	6.7	6.500	10.3		
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Rainfall Model FSR Ratio R 0.422																																																																																																																																																	
Region England and Wales Cv (Summer) 0.750																																																																																																																																																	
M5-60 (mm) 19.000 Cv (Winter) 0.840																																																																																																																																																	
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Analysis Timestep 2.5 Second Increment (Extended)																																																																																																																																																	
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Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080																																																																																																																																																	
Return Period(s) (years) 1, 30, 100																																																																																																																																																	
Climate Change (%) 0, 35, 40																																																																																																																																																	
<table><tr><th>PN</th><th>US/MH Name</th><th>Storm</th><th>Return Period</th><th>Climate Change</th><th>First (X) Surcharge</th><th>First (Y) Flood</th><th>First (Z) Overflow</th><th>Overflow Act.</th><th>Water Level (m)</th></tr><tr><td>S1.000</td><td>S1</td><td>15 Winter</td><td>1</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>3.226</td></tr><tr><td>S1.001</td><td>S2</td><td>15 Winter</td><td>1</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>3.133</td></tr><tr><td>S1.002</td><td>S3</td><td>15 Winter</td><td>1</td><td>+0%</td><td>30/15 Winter</td><td></td><td></td><td></td><td>3.026</td></tr><tr><td>S1.003</td><td>S4</td><td>15 Winter</td><td>1</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>2.981</td></tr><tr><td>S1.004</td><td>S5</td><td>15 Winter</td><td>1</td><td>+0%</td><td>30/15 Winter</td><td></td><td></td><td></td><td>2.958</td></tr><tr><td>S1.005</td><td>S6</td><td>15 Winter</td><td>1</td><td>+0%</td><td>30/15 Winter</td><td></td><td></td><td></td><td>2.930</td></tr><tr><td>S1.006</td><td>S7</td><td>15 Winter</td><td>1</td><td>+0%</td><td>30/15 Winter</td><td></td><td></td><td></td><td>2.892</td></tr><tr><td>S1.007</td><td>S8</td><td>15 Winter</td><td>1</td><td>+0%</td><td>30/15 Winter</td><td></td><td></td><td></td><td>2.833</td></tr><tr><td>S2.000</td><td>S9</td><td>15 Winter</td><td>1</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>2.971</td></tr><tr><td>S2.001</td><td>S10</td><td>15 Winter</td><td>1</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>2.855</td></tr><tr><td>S1.008</td><td>S11</td><td>15 Winter</td><td>1</td><td>+0%</td><td>30/15 Winter</td><td></td><td></td><td></td><td>2.759</td></tr><tr><td>S1.009</td><td>S12</td><td>15 Winter</td><td>1</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>2.549</td></tr><tr><td>S1.010</td><td>S13</td><td>15 Winter</td><td>1</td><td>+0%</td><td></td><td></td><td></td><td></td><td>2.509</td></tr></table>						PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	S1.000	S1	15 Winter	1	+0%	100/15 Summer				3.226	S1.001	S2	15 Winter	1	+0%	100/15 Summer				3.133	S1.002	S3	15 Winter	1	+0%	30/15 Winter				3.026	S1.003	S4	15 Winter	1	+0%	30/15 Summer				2.981	S1.004	S5	15 Winter	1	+0%	30/15 Winter				2.958	S1.005	S6	15 Winter	1	+0%	30/15 Winter				2.930	S1.006	S7	15 Winter	1	+0%	30/15 Winter				2.892	S1.007	S8	15 Winter	1	+0%	30/15 Winter				2.833	S2.000	S9	15 Winter	1	+0%	100/15 Summer				2.971	S2.001	S10	15 Winter	1	+0%	100/15 Summer				2.855	S1.008	S11	15 Winter	1	+0%	30/15 Winter				2.759	S1.009	S12	15 Winter	1	+0%	30/15 Summer				2.549	S1.010	S13	15 Winter	1	+0%					2.509
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Micro
Drainage

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level Exceeded
		Depth	Volume			Time	Flow		
		(m)	(m³)			(mins)	(l/s)		
S1.000	S1	-0.269	0.000	0.17			17.2	OK	
S1.001	S2	-0.250	0.000	0.24			23.9	OK	
S1.002	S3	-0.230	0.000	0.27			25.5	OK	
S1.003	S4	-0.215	0.000	0.36			27.2	OK	
S1.004	S5	-0.214	0.000	0.38			28.2	OK	
S1.005	S6	-0.216	0.000	0.38			28.3	OK	
S1.006	S7	-0.228	0.000	0.31			29.0	OK	
S1.007	S8	-0.227	0.000	0.33			30.2	OK	
S2.000	S9	-0.270	0.000	0.17			17.0	OK	
S2.001	S10	-0.255	0.000	0.22			21.9	OK	
S1.008	S11	-0.242	0.000	0.27			52.3	OK	
S1.009	S12	-0.167	0.000	0.59			52.1	OK	
S1.010	S13	-0.176	0.000	0.47			52.3	OK	

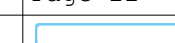
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1 Malin Hill Nottingham NG1 1JQ					MA11542 Lowgate Holbeach SWS Design R01					
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm										
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surgecharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	
S1.011	S14	15 Winter	1	+0%					2.475	
S1.012	S15	15 Winter	1	+0%					2.439	
S3.000	S16	15 Winter	1	+0%					2.875	
S3.001	S17	15 Winter	1	+0%					2.772	
S3.002	S18	15 Winter	1	+0%					2.634	
S3.003	S19	1440 Winter	1	+0%					2.321	
S3.004	S20	1440 Winter	1	+0%					2.277	
S4.000	S21	15 Winter	1	+0%	30/15 Winter				2.958	
S4.001	S22	15 Winter	1	+0%	30/15 Summer	100/15 Winter			2.859	
S4.002	S23	15 Winter	1	+0%	30/15 Summer				2.778	
S4.003	S24	15 Winter	1	+0%	30/15 Summer				2.692	
S4.004	S25	15 Winter	1	+0%	30/15 Summer				2.633	
S4.005	S26	15 Winter	1	+0%	30/15 Summer				2.581	
S5.000	S27	15 Winter	1	+0%	30/15 Summer				2.618	
S5.001	S28	15 Winter	1	+0%	30/15 Summer				2.579	
S5.002	S29	15 Winter	1	+0%	30/15 Summer				2.576	
S4.006	S30	15 Winter	1	+0%	30/15 Summer				2.572	
S4.007	S31	15 Winter	1	+0%	30/15 Summer				2.545	
S1.013	S32	720 Winter	1	+0%					2.216	
S1.014	S33	720 Winter	1	+0%	30/30 Winter				2.204	
Surcharged Flooded Half Drain Pipe										
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded	
S1.011	S14	-0.128	0.000	0.55			51.6	OK		
S1.012	S15	-0.101	0.000	0.89			51.3	OK		
S3.000	S16	-0.241	0.000	0.08			5.4	OK		
S3.001	S17	-0.222	0.000	0.15			9.6	OK		
S3.002	S18	-0.225	0.000	0.14			9.6	OK		
S3.003	S19	-0.296	0.000	0.00			0.2	OK		
S3.004	S20	-0.289	0.000	0.01			0.2	OK		
S4.000	S21	-0.232	0.000	0.11			7.3	OK		
S4.001	S22	-0.212	0.000	0.19			11.8	OK		1
S4.002	S23	-0.199	0.000	0.24			15.4	OK		
S4.003	S24	-0.190	0.000	0.29			17.6	OK		
S4.004	S25	-0.181	0.000	0.33			21.2	OK		
S4.005	S26	-0.096	0.000	0.43			20.9	OK		
S5.000	S27	-0.224	0.000	0.14			9.1	OK		
S5.001	S28	-0.148	0.000	0.19			10.5	OK		
S5.002	S29	-0.112	0.000	0.21			11.6	OK		
S4.006	S30	-0.080	0.000	0.46			28.3	OK		
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Half Drain	Pipe	Level	
		Depth (m)	Volume (m ³)	Cap.	(l/s)	Time (mins)	Flow (l/s)	Status	Exceeded
S4.007	S31	-0.020	0.000	1.00			26.2	OK	
S1.013	S32	-0.318	0.000	0.03			3.0	OK	
S1.014	S33	-0.057	0.000	0.18			3.0	OK	

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<u>30 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		10.000				
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 Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0									
<u>Synthetic Rainfall Details</u>									
Rainfall Model		FSR	Ratio R		0.422				
Region England and Wales Cv (Summer)		0.750							
M5-60 (mm)		19.000	Cv (Winter)		0.840				
Margin for Flood Risk Warning (mm)		450.0							
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, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080							
Return Period(s) (years)		1, 30, 100							
Climate Change (%)		0, 35, 40							
	US/MH		Return	Climate					Water
PN	Name	Storm	Period	Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
S1.000	S1	15 Winter	30	+35%	100/15 Summer				3.357
S1.001	S2	15 Winter	30	+35%	100/15 Summer				3.315
S1.002	S3	15 Winter	30	+35%	30/15 Winter				3.256
S1.003	S4	15 Winter	30	+35%	30/15 Summer				3.211
S1.004	S5	15 Winter	30	+35%	30/15 Winter				3.182
S1.005	S6	15 Winter	30	+35%	30/15 Winter				3.150
S1.006	S7	15 Winter	30	+35%	30/15 Winter				3.120
S1.007	S8	15 Winter	30	+35%	30/15 Winter				3.066
S2.000	S9	15 Winter	30	+35%	100/15 Summer				3.083
S2.001	S10	15 Winter	30	+35%	100/15 Summer				3.044
S1.008	S11	15 Winter	30	+35%	30/15 Winter				3.008
S1.009	S12	15 Winter	30	+35%	30/15 Summer				2.821
S1.010	S13	30 Winter	30	+35%					2.556
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Flow / Overflow Cap. (l/s)	Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)					
S1.000	S1	-0.138	0.000	0.56				55.4	FLOOD RISK	
S1.001	S2	-0.068	0.000	0.76				76.4	FLOOD RISK	
S1.002	S3	0.000	0.000	0.84				77.9	FLOOD RISK	
S1.003	S4	0.015	0.000	1.11				83.8	FLOOD RISK	
S1.004	S5	0.010	0.000	1.15				86.3	FLOOD RISK	
S1.005	S6	0.004	0.000	1.15				86.1	FLOOD RISK	
S1.006	S7	0.000	0.000	0.95				88.3	SURCHARGED	
S1.007	S8	0.006	0.000	0.99				90.9	SURCHARGED	
S2.000	S9	-0.158	0.000	0.55				56.0	OK	
S2.001	S10	-0.066	0.000	0.68				67.9	FLOOD RISK	
S1.008	S11	0.007	0.000	0.80				153.1	SURCHARGED	
S1.009	S12	0.105	0.000	1.75				153.5	FLOOD RISK	
S1.010	S13	-0.129	0.000	0.56				62.8	OK	

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<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.011	S14	30 Winter	30	+35%					2.525
S1.012	S15	30 Winter	30	+35%					2.490
S3.000	S16	15 Winter	30	+35%					2.925
S3.001	S17	15 Winter	30	+35%					2.854
S3.002	S18	15 Winter	30	+35%					2.712
S3.003	S19	960 Winter	30	+35%					2.332
S3.004	S20	600 Winter	30	+35%					2.340
S4.000	S21	15 Winter	30	+35%	30/15 Winter				3.233
S4.001	S22	15 Winter	30	+35%	30/15 Summer	100/15 Winter			3.210
S4.002	S23	15 Winter	30	+35%	30/15 Summer				3.178
S4.003	S24	15 Winter	30	+35%	30/15 Summer				3.136
S4.004	S25	15 Winter	30	+35%	30/15 Summer				3.093
S4.005	S26	15 Winter	30	+35%	30/15 Summer				2.999
S5.000	S27	15 Winter	30	+35%	30/15 Summer				3.034
S5.001	S28	15 Winter	30	+35%	30/15 Summer				3.006
S5.002	S29	15 Winter	30	+35%	30/15 Summer				2.986
S4.006	S30	15 Winter	30	+35%	30/15 Summer				2.964
S4.007	S31	15 Winter	30	+35%	30/15 Summer				2.759
S1.013	S32	600 Winter	30	+35%					2.340
S1.014	S33	720 Winter	30	+35%	30/30 Winter				2.354
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.011	S14	-0.078	0.000	0.64			59.3	OK	
S1.012	S15	-0.050	0.000	1.00			57.9	OK	
S3.000	S16	-0.191	0.000	0.28			17.8	OK	
S3.001	S17	-0.140	0.000	0.54			34.9	OK	
S3.002	S18	-0.147	0.000	0.51			34.4	OK	
S3.003	S19	-0.285	0.000	0.01			0.4	OK	
S3.004	S20	-0.226	0.000	0.01			0.4	OK	
S4.000	S21	0.043	0.000	0.35			22.4	FLOOD RISK	
S4.001	S22	0.139	0.000	0.53			33.3	FLOOD RISK	1
S4.002	S23	0.201	0.000	0.63			39.6	FLOOD RISK	
S4.003	S24	0.254	0.000	0.72			43.3	SURCHARGED	
S4.004	S25	0.279	0.000	0.81			52.4	SURCHARGED	
S4.005	S26	0.322	0.000	1.19			58.2	FLOOD RISK	
S5.000	S27	0.192	0.000	0.39			25.2	SURCHARGED	
S5.001	S28	0.279	0.000	0.58			31.8	SURCHARGED	
S5.002	S29	0.298	0.000	0.71			38.2	SURCHARGED	
S4.006	S30	0.312	0.000	1.53			95.0	FLOOD RISK	
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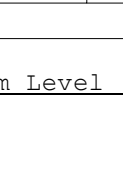
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Surcharged Flooded				Half Drain	Pipe	Status	Level Exceeded
	US/MH	Depth	Volume	Flow / Overflow	Time	Flow		
	Name	(m)	(m³)	Cap. (l/s)	(mins)	(l/s)		
S4.007	S31	0.194	0.000	3.64		95.2	FLOOD RISK	
S1.013	S32	-0.195	0.000	0.08		7.5	OK	
S1.014	S33	0.093	0.000	0.28		4.7	SURCHARGED	

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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	10.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.422
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
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, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%	100/15 Summer				3.660
S1.001	S2	15 Winter	100	+40%	100/15 Summer				3.614
S1.002	S3	15 Winter	100	+40%	30/15 Winter				3.519
S1.003	S4	15 Winter	100	+40%	30/15 Summer				3.454
S1.004	S5	15 Winter	100	+40%	30/15 Winter				3.429
S1.005	S6	15 Winter	100	+40%	30/15 Winter				3.399
S1.006	S7	15 Winter	100	+40%	30/15 Winter				3.371
S1.007	S8	15 Winter	100	+40%	30/15 Winter				3.314
S2.000	S9	15 Winter	100	+40%	100/15 Summer				3.358
S2.001	S10	15 Winter	100	+40%	100/15 Summer				3.311
S1.008	S11	15 Winter	100	+40%	30/15 Winter				3.243
S1.009	S12	15 Winter	100	+40%	30/15 Summer				2.926
S1.010	S13	30 Winter	100	+40%					2.573

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

PN	US/MH Name	Surcharged Flooded		Flow / Overflow Cap. (l/s)	Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)					
S1.000	S1	0.165	0.000	0.69		68.3	FLOOD RISK	
S1.001	S2	0.231	0.000	0.88		88.4	FLOOD RISK	
S1.002	S3	0.263	0.000	1.03		96.0	FLOOD RISK	
S1.003	S4	0.258	0.000	1.35		101.5	FLOOD RISK	
S1.004	S5	0.257	0.000	1.38		103.7	FLOOD RISK	
S1.005	S6	0.254	0.000	1.42		106.3	FLOOD RISK	
S1.006	S7	0.251	0.000	1.17		108.8	FLOOD RISK	
S1.007	S8	0.254	0.000	1.20		110.5	FLOOD RISK	
S2.000	S9	0.117	0.000	0.70		70.9	FLOOD RISK	
S2.001	S10	0.201	0.000	0.78		77.8	FLOOD RISK	
S1.008	S11	0.242	0.000	1.03		195.4	FLOOD RISK	
S1.009	S12	0.210	0.000	2.25		197.3	FLOOD RISK	
S1.010	S13	-0.112	0.000	0.56		62.9	OK	

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

PN	Surcharged Flooded				Half Drain	Pipe	Status	Level Exceeded
	US/MH	Depth	Volume	Flow / Overflow	Time	Flow		
	Name	(m)	(m³)	Cap. (l/s)	(mins)	(l/s)		
S4.007	S31	0.343	0.000	4.65		121.6	FLOOD RISK	
S1.013	S32	-0.133	0.000	0.07		6.6	OK	
S1.014	S33	0.150	0.000	0.29		4.9	SURCHARGED	