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Victoria Count Tennant St Nuneaton Warwickshire CV11 4LZ	The Grove (Latest Site Plan) CO22/289/07	
Date 24/10/2024 File NETWORK.MDX	Designed by MN Checked by MN	
XP Solutions	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

« - 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	8.000	0.055	145.5	0.041	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	8.500	0.105	81.0	0.014	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	18.770	0.035	536.3	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	8.000	0.035	228.6	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	45.000	0.225	200.0	0.005	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	9.600	0.050	192.0	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	10.250	0.070	146.4	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)
1.000	50.00	5.16	198.250	0.041	0.0	0.0	0.0	0.83	14.7	5.6
2.000	50.00	5.17	198.350	0.014	0.0	0.0	0.0	0.86	6.7	1.9
1.001	50.00	5.73	198.120	0.085	0.0	0.0	0.0	0.56	22.2	11.5
1.002	50.00	5.88	198.085	0.110	0.0	0.0	0.0	0.86	34.2	14.9
1.003	50.00	6.70	198.050	0.115	0.0	0.0	0.0	0.92	36.6	15.6
1.004	50.00	6.87	197.825	0.150	0.0	0.0	0.0	0.94	37.4	20.3
1.005	50.00	7.07	197.850	0.150	0.0	0.0	0.0	0.83	14.6«	20.3

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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)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	199.350	1.100	Open Manhole	1200	1.000	198.250	150				
2	199.230	0.880	Open Manhole	1200	2.000	198.350	100				
3	199.170	1.050	Open Manhole	1200	1.001	198.120	225	1.000	198.195	150	
								2.000	198.245	100	
4	199.170	1.085	Open Manhole	1200	1.002	198.085	225	1.001	198.085	225	
5	199.230	1.180	Open Manhole	1200	1.003	198.050	225	1.002	198.050	225	
6	199.680	1.855	Open Manhole	1200	1.004	197.825	225	1.003	197.825	225	
7	199.680	1.905	Open Manhole	1200	1.005	197.850	150	1.004	197.775	225	
	200.080	2.300	Open Manhole	0		OUTFALL		1.005	197.780	150	

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Simulation Criteria for Storm

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)	20.000	Storm Duration (mins)	30
Ratio R	0.405		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 7, DS/PN: 1.005, Volume (m³): 2.4

Unit Reference	MD-SHE-0063-2000-1320-2000
Design Head (m)	1.320
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	63
Invert Level (m)	197.850
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.320	2.0
Flush-Flo™	0.277	1.7
Kick-Flo®	0.560	1.4
Mean Flow over Head Range	-	1.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	1.9	3.000	2.9	7.000	4.3
0.200	1.6	1.400	2.0	3.500	3.1	7.500	4.5
0.300	1.7	1.600	2.2	4.000	3.3	8.000	4.6
0.400	1.6	1.800	2.3	4.500	3.5	8.500	4.7
0.500	1.5	2.000	2.4	5.000	3.7	9.000	4.9
0.600	1.4	2.200	2.5	5.500	3.9	9.500	5.0
0.800	1.6	2.400	2.6	6.000	4.0		
1.000	1.8	2.600	2.7	6.500	4.2		

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<u>Summary of Critical Results by Maximum Level (Rank 1) 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 1 Number of Online Controls 1 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 0.407 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 19.900 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status OFF DVD Status ON 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																																																																																																											
<table><tr><th colspan="2"></th><th colspan="2"></th><th colspan="2"></th><th colspan="2"></th><th>Water</th></tr><tr><th>US/MH</th><th></th><th>Return</th><th>Climate</th><th>First (X)</th><th>First (Y)</th><th>First (Z)</th><th>Overflow</th><th>Level</th></tr><tr><th>PN</th><th>Name</th><th>Storm</th><th>Period</th><th>Change</th><th>Surcharge</th><th>Flood</th><th>Overflow</th><th>Act.</th></tr><tr><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>(m)</th></tr><tr><td>1.000</td><td>1</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/15 Winter</td><td></td><td></td><td>198.968</td></tr><tr><td>2.000</td><td>2</td><td>240 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td>198.967</td></tr><tr><td>1.001</td><td>3</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/60 Summer</td><td></td><td></td><td>198.966</td></tr><tr><td>1.002</td><td>4</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/15 Summer</td><td></td><td></td><td>198.964</td></tr><tr><td>1.003</td><td>5</td><td>240 Winter</td><td>100</td><td>+40%</td><td>1/30 Winter</td><td></td><td></td><td>198.962</td></tr><tr><td>1.004</td><td>6</td><td>240 Winter</td><td>100</td><td>+40%</td><td>1/15 Summer</td><td></td><td></td><td>198.958</td></tr><tr><td>1.005</td><td>7</td><td>240 Winter</td><td>100</td><td>+40%</td><td>1/15 Summer</td><td></td><td></td><td>198.956</td></tr></table>																	Water	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.									(m)	1.000	1	240 Winter	100	+40%	30/15 Winter			198.968	2.000	2	240 Winter	100	+40%	100/15 Summer			198.967	1.001	3	240 Winter	100	+40%	30/60 Summer			198.966	1.002	4	240 Winter	100	+40%	30/15 Summer			198.964	1.003	5	240 Winter	100	+40%	1/30 Winter			198.962	1.004	6	240 Winter	100	+40%	1/15 Summer			198.958	1.005	7	240 Winter	100	+40%	1/15 Summer			198.956
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