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5th Floor, Waterfront House 35 Station Street Nottingham, NG2 3DQ	Yew Tree Care Home Northern Moor	
Date 17/07/2023 File 220454-Network Calculat...	Designed by IB Checked by IB	
Innovyze	Network 2020.1	

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)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	75	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 Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.087	4-8	0.055	8-12	0.024	12-16	0.012

Total Area Contributing (ha) = 0.178

Total Pipe Volume (m³) = 11.910

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
1.000	19.000	0.190	100.0	0.007	7.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	44.000	0.176	250.0	0.025	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	17.501	0.070	250.0	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	20.500	0.082	250.0	0.029	7.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	7.000	0.028	250.0	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	15.000	0.060	250.0	0.005	0.00	0.0	0.600	o	300	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	50.64	7.32	31.420	0.007	0.0	0.0	0.0	1.00	17.8	1.0
1.001	48.34	8.06	31.080	0.032	0.0	0.0	0.0	0.99	70.0	4.2
1.002	47.49	8.35	30.904	0.036	0.0	0.0	0.0	0.99	70.0	4.6
2.000	50.54	7.35	31.446	0.029	0.0	0.0	0.0	0.99	70.0	4.0
2.001	50.16	7.46	31.364	0.033	0.0	0.0	0.0	0.99	70.0	4.5
2.002	49.37	7.72	31.336	0.038	0.0	0.0	0.0	0.99	70.0	5.1

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Synthetic Rainfall Details

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)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S1, DS/PN: 1.004, Volume (m³): 6.5

Unit Reference	MD-SHE-0111-6000-1300-6000
Design Head (m)	1.300
Design Flow (l/s)	6.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	111
Invert Level (m)	30.668
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	6.0
Flush-Flo™	0.383	6.0
Kick-Flo®	0.804	4.8
Mean Flow over Head Range	-	5.2

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	3.8	1.200	5.8	3.000	8.9	7.000	13.3
0.200	5.6	1.400	6.2	3.500	9.6	7.500	13.7
0.300	5.9	1.600	6.6	4.000	10.2	8.000	14.2
0.400	6.0	1.800	7.0	4.500	10.8	8.500	14.6
0.500	5.9	2.000	7.3	5.000	11.3	9.000	15.0
0.600	5.8	2.200	7.7	5.500	11.8	9.500	15.4
0.800	4.8	2.400	8.0	6.000	12.3		
1.000	5.3	2.600	8.3	6.500	12.8		

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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 1
 Number of Online Controls 1 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 0.359
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 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, 4320, 5760,
 7200, 8640, 10080
 Return Period(s) (years) 100
 Climate Change (%) 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	S5 120 minute	100 year Winter I+45%	32.470	31.723	0.153	0.000
1.001	S4 120 minute	100 year Winter I+45%	32.546	31.723	0.343	0.000
1.002	S3 120 minute	100 year Winter I+45%	32.444	31.722	0.518	0.000
2.000	S11 120 minute	100 year Winter I+45%	32.496	31.702	-0.044	0.000
2.001	S10 120 minute	100 year Winter I+45%	32.470	31.701	0.037	0.000
2.002	S9 120 minute	100 year Winter I+45%	32.538	31.700	0.064	0.000
2.003	S8 120 minute	100 year Winter I+45%	32.482	31.704	0.128	0.000
2.004	S7 120 minute	100 year Winter I+45%	32.479	31.705	0.228	0.000
3.000	Perm. Paving U/S	120 minute 100 year Winter I+45%	32.531	31.691	0.001	0.000
2.005	S6 120 minute	100 year Winter I+45%	32.517	31.702	0.263	0.000
1.003	S2 120 minute	100 year Winter I+45%	32.484	31.721	0.587	0.000
1.004	S1 120 minute	100 year Winter I+45%	32.453	31.726	0.908	0.000

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flow / Overflow		Maximum	Pipe	Status	
		Cap.	(l/s)	Vol (m³)	Flow (l/s)		
1.000		S5	0.08		0.084	1.3	SURCHARGED
1.001		S4	0.09		0.505	5.8	SURCHARGED
1.002		S3	0.11		3.298	6.5	SURCHARGED
2.000		S11	0.09		0.071	5.4	OK
2.001		S10	0.11		1.413	5.8	SURCHARGED
2.002		S9	0.11		0.543	6.4	SURCHARGED
2.003		S8	0.13		1.137	7.8	SURCHARGED
2.004		S7	0.18		1.859	9.9	SURCHARGED
3.000	Perm. Paving	U/S	0.07		42.278	18.9	SURCHARGED*
2.005		S6	0.05		2.127	16.9	SURCHARGED
1.003		S2	0.11		3.463	13.5	SURCHARGED
1.004		S1	0.25		3.996	6.0	SURCHARGED