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The Stables Aske Hall, Richmond N Yorkshire DL10 5HG	Brunswick Street Thurnscoe Network 1	
Date 19/08/2019 File 5022 SW Network 1.MDX	Designed by D.Lamb Checked by	
XP Solutions	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 5022 SW Network 1.sws

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 (%)	0
Ratio R	0.394	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	0.000
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 5022 SW Network 1.sws

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.090	4-8	0.008

Total Area Contributing (ha) = 0.098

Total Pipe Volume (m<sup>3</sup>) = 45.509

Network Design Table for 5022 SW Network 1.sws

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	25.188	1.000	25.2	0.098	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	15.000	0.050	300.0	0.000	0.00	0.0	0.600	[ ]	-1	Pipe/Conduit	
1.002	1.078	0.100	10.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	2.562	0.100	25.6	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	0.00	4.21	63.800	0.098	0.0	0.0	0.0	2.01	35.6	0.0
1.001	0.00	4.30	62.000	0.098	0.0	0.0	0.0	2.59	7776.4	0.0
1.002	0.00	4.31	61.950	0.098	0.0	0.0	0.0	3.09	54.5	0.0
1.003	0.00	4.33	61.850	0.098	0.0	0.0	0.0	2.00	35.3	0.0

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Conduit Sections for 5022 SW Network 1.sws

NOTE: Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \ / open channel, oo dual pipe, ooo triple pipe, 0 egg.

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m <sup>2</sup> )
-1	[]	2500	1200	90.0		1.622	3.000

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Manhole Schedules for 5022 SW Network 1.sws

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)
S1	64.525	0.725	Open Manhole	450	1.000	63.800	150				
S2	64.080	2.080	Open Manhole	450	1.001	62.000	-1	1.000	62.800	150	150
S3	63.705	1.755	Open Manhole	450	1.002	61.950	150	1.001	61.950	-1	
S4	63.705	1.855	Open Manhole	1050	1.003	61.850	150	1.002	61.850	150	
S5	63.465	1.715	Open Manhole	0		OUTFALL		1.003	61.750	150	

Free Flowing Outfall Details for 5022 SW Network 1.sws

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003	S5	63.465	61.750	1.900	0	0

Simulation Criteria for 5022 SW Network 1.sws

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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 0    Number of Real Time Controls 0

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)	19.000	Storm Duration (mins)	30
Ratio R	0.394		

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Online Controls for 5022 SW Network 1.sws

Orifice Manhole: S4, DS/PN: 1.003, Volume (m³): 1.6

Diameter (m) 0.032 Discharge Coefficient 0.600 Invert Level (m) 61.850

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2 year Return Period Summary of Critical Results by Maximum Overflow (Rank 1) for 5022 SW Network 1.sws

Simulation Criteria

Areal Reduction Factor 1.000    Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0    MADD Factor \* 10m<sup>3</sup>/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 0    Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model    FSR M5-60 (mm) 19.000 Cv (Summer) 0.750  
Region England and Wales    Ratio R 0.394 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, 180, 240, 360, 480, 600, 720,  
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,  
10080  
Return Period(s) (years)    2, 30, 100  
Climate Change (%)    0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1	360 Winter	2	+0%	100/15	Summer			63.826	-0.124
1.001	S2	360 Winter	2	+0%					62.228	-0.972
1.002	S3	360 Winter	2	+0%	2/15	Summer			62.228	0.128
1.003	S4	360 Winter	2	+0%	2/15	Summer			62.233	0.233

PN	US/MH Name	Flooded Volume (m <sup>3</sup> )	Flow / Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.000	0.07	2.4	OK	
1.001	S2	0.000	0.00	2.4	OK	
1.002	S3	0.000	0.07	1.4	SURCHARGED	
1.003	S4	0.000	0.07	1.3	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Overflow (Rank 1) for 5022 SW Network 1.sws

Simulation Criteria

Areal Reduction Factor 1.000    Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0    MADD Factor \* 10m<sup>3</sup>/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 0    Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model    FSR M5-60 (mm) 19.000 Cv (Summer) 0.750  
Region England and Wales    Ratio R 0.394 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, 180, 240, 360, 480, 600, 720,  
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,  
10080  
Return Period(s) (years)    2, 30, 100  
Climate Change (%)    0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1	360 Winter	30	+0%	100/15	Summer			63.836	-0.114
1.001	S2	360 Winter	30	+0%					62.505	-0.695
1.002	S3	360 Winter	30	+0%	2/15	Summer			62.505	0.405
1.003	S4	360 Winter	30	+0%	2/15	Summer			62.510	0.510

PN	US/MH Name	Flooded Volume (m <sup>3</sup> )	Flow / Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.000	0.13	4.5	OK	
1.001	S2	0.000	0.00	4.4	OK	
1.002	S3	0.000	0.09	1.9	SURCHARGED	
1.003	S4	0.000	0.09	1.7	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Overflow (Rank 1) for 5022 SW Network 1.sws

Simulation Criteria

Areal Reduction Factor 1.000    Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0    MADD Factor \* 10m<sup>3</sup>/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 0    Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model    FSR M5-60 (mm) 19.000    Cv (Summer) 0.750  
Region England and Wales    Ratio R 0.394    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, 180, 240, 360, 480, 600, 720,  
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,  
10080  
Return Period(s) (years)    2, 30, 100  
Climate Change (%)    0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1	360 Winter	100	+30%	100/15	Summer			63.848	-0.102
1.001	S2	360 Winter	100	+30%					62.986	-0.214
1.002	S3	360 Winter	100	+30%	2/15	Summer			62.986	0.886
1.003	S4	360 Winter	100	+30%	2/15	Summer			62.991	0.991

PN	US/MH Name	Flooded Volume (m <sup>3</sup> )	Flow / Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.000	0.22	7.5	OK	
1.001	S2	0.000	0.00	7.5	OK	
1.002	S3	0.000	0.12	2.4	SURCHARGED	
1.003	S4	0.000	0.11	2.3	SURCHARGED	