



Date 05/08/2019 18:04
File GRAIG ROAD r1.MDX

Designed by
Checked by

XP Solutions

Network 2019.1

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)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.227	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	88	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)
0-4	0.438	4-8	0.062

Total Area Contributing (ha) = 0.500

Total Pipe Volume (m³) = 2.928

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	8.650	0.087	99.4	0.035	4.00	0.0	0.600	o	100	Pipe/Conduit	🟢
1.001	10.500	0.105	100.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	🟢
1.002	15.000	6.608	2.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🟢
1.003	16.000	4.725	3.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🟢
1.004	8.300	0.700	11.9	0.000	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	55.61	4.19	101.900	0.035	0.0	0.0	0.0	0.77	6.1	5.3
1.001	54.68	4.41	101.813	0.035	0.0	0.0	0.0	0.77	6.0	5.3
1.002	54.59	4.44	101.508	0.035	0.0	0.0	0.0	10.51	742.8	5.3
1.003	54.46	4.47	94.900	0.035	0.0	0.0	0.0	8.60	608.0	5.3
1.004	54.34	4.50	90.175	0.035	0.0	0.0	0.0	4.59	324.5	5.3

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)
1.004	EXISTING GULLY	90.410	89.475	89.600	450	0



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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/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 0			
Number of Storage Structures 0			
Number of Real Time Controls 0			

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.227		



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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.225 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
									(m)	(m)	(m³)
1.000	HW1&2	15 Summer	1	+0%	30/15 Summer	100/15 Summer			101.966	-0.034	0.000
1.001	HW3	15 Summer	1	+0%	30/15 Summer				101.879	-0.034	0.000
1.002	S3	15 Summer	1	+0%					101.518	-0.290	0.000
1.003	S2	15 Summer	1	+0%					94.912	-0.288	0.000
1.004	S1	15 Winter	1	+0%					90.204	-0.271	0.000

PN	US/MH Name	Flow / Cap.	Pipe Flow (l/s)	Overflow Flow (l/s)	Pipe Status	Level
						Exceeded
1.000	HW1&2	0.77		4.3	OK	4
1.001	HW3	0.75		4.2	OK	
1.002	S3	0.01		4.3	OK	
1.003	S2	0.01		4.3	OK	
1.004	S1	0.02		4.2	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.225 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 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)	Flooded Volume (m³)
1.000	HW1&2	15 Winter	30	+0%	30/15 Summer	100/15 Summer			102.204	0.204	0.000
1.001	HW3	15 Winter	30	+0%	30/15 Summer				102.014	0.101	0.000
1.002	S3	15 Winter	30	+0%					101.526	-0.282	0.000
1.003	S2	15 Winter	30	+0%					94.922	-0.278	0.000
1.004	S1	15 Winter	30	+0%					90.213	-0.262	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	HW1&2	1.48		8.3	FLOOD RISK	4
1.001	HW3	1.42		8.0	SURCHARGED	
1.002	S3	0.01		8.0	OK	
1.003	S2	0.02		8.0	OK	
1.004	S1	0.04		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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.225 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	HW1&2	15 Winter	100	+30%	30/15 Summer	100/15 Summer			102.500	0.500	0.449
1.001	HW3	15 Summer	100	+30%	30/15 Summer				102.181	0.268	0.000
1.002	S3	15 Summer	100	+30%					101.532	-0.276	0.000
1.003	S2	30 Summer	100	+30%					94.930	-0.270	0.000
1.004	S1	30 Summer	100	+30%					90.218	-0.257	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	HW1&2	2.00		11.2	FLOOD	4
1.001	HW3	1.90		10.7	SURCHARGED	
1.002	S3	0.02		10.7	OK	
1.003	S2	0.02		10.7	OK	
1.004	S1	0.05		10.7	OK	