

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	
Return Period (years)	2
FEH Rainfall Version	1999
Site Location	GB 476550 165050 SU 76550 65050
C (1km)	-0.028
D1 (1km)	0.261
D2 (1km)	0.255
D3 (1km)	0.327
E (1km)	0.303
F (1km)	2.642
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
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)
0-4	0.101	4-8	0.447	8-12	0.003

Total Area Contributing (ha) = 0.551

Total Pipe Volume (m³) = 22.579

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
S1.000	5.547	0.159	34.9	0.009	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	14.144	0.085	167.0	0.017	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	14.478	0.087	167.0	0.015	0.00	0.0	0.600	o	225	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	50.00	4.05	58.404	0.009	0.0	0.0	0.0	1.71	30.2	1.2
S1.001	50.00	4.80	58.245	0.060	0.0	0.0	0.0	1.01	40.1	8.1
S1.002	50.00	5.04	58.160	0.074	0.0	0.0	0.0	1.01	40.1	10.0

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Coombe House Coombe Square Thatcham, RG19 4JF	FINCHWOOD PARK PARCEL 8 SURFACE WATER DRAINAGE CALCS	
Date 01/04/2023	Designed by TA	
File 6860 - Drainage Design MM 14032...	Checked by MAS	
Innovyze	Network 2020.1.3	

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
S4.003	18.280	0.109	167.7	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	19.817	0.083	238.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	37.449	0.108	346.8	0.016	0.00	0.0	0.600	o	450	Pipe/Conduit	
S15.002	11.462	0.069	166.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	39.649	0.050	793.0	0.047	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.007	38.301	0.400	95.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	31.828	0.186	171.1	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)
S4.003	50.00	4.95	58.182	0.161	0.0	0.0	0.0	1.01	40.0	21.8
S1.003	50.00	5.36	57.998	0.244	0.0	0.0	0.0	1.01	71.6	33.0
S1.004	50.00	5.94	57.765	0.411	0.0	0.0	0.0	1.09	172.7	55.6
S15.002	50.00	4.49	57.951	0.038	0.0	0.0	0.0	1.01	40.2	5.2
S1.005	50.00	6.86	57.657	0.496	0.0	0.0	0.0	0.71	113.6	67.2
S1.007	50.00	7.62	57.550	0.551	0.0	0.0	0.0	1.03	18.2«	74.6
S1.008	50.00	8.32	57.150	0.551	0.0	0.0	0.0	0.77	13.5«	74.6

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)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	59.754	1.350	Open Manhole	1200	S1.000	58.404	150				
S2	59.826	1.581	Open Manhole	1200	S1.001	58.245	225	S1.000	58.245	150	
								S2.001	58.320	150	
S3	59.906	1.746	Open Manhole	1200	S1.002	58.160	225	S1.001	58.160	225	
S9	59.907	1.725	Open Manhole	1200	S4.003	58.182	225	S4.002	58.182	225	
S4	59.784	1.786	Open Manhole	1500	S1.003	57.998	300	S1.002	58.073	225	
								S4.003	58.073	225	
								S7.000	58.148	150	
S5	59.558	1.793	Open Manhole	1500	S1.004	57.765	450	S1.003	57.915	300	
								S8.001	58.119	150	54
								S10.003	58.119	150	54
S10	59.365	1.414	Open Manhole	1200	S15.002	57.951	225	S15.001	58.026	150	
S6	59.250	1.593	Open Manhole	1500	S1.005	57.657	450	S1.004	57.657	450	
								S15.002	57.882	225	
S7	59.050	1.500	Open Manhole	1200	S1.007	57.550	150	S1.006	57.554	150	4
S8	58.450	1.300	Open Manhole	1200	S1.008	57.150	150	S1.007	57.150	150	
S	57.950	0.986	Open Manhole	0		OUTFALL		S1.008	56.964	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	476775.144	164659.502	476775.144	164659.502	Required	
S2	476780.415	164657.774	476780.415	164657.774	Required	
S3	476793.925	164653.588	476793.925	164653.588	Required	
S9	476806.065	164633.708	476806.065	164633.708	Required	
S4	476808.299	164651.852	476808.299	164651.852	Required	
S5	476827.972	164649.463	476827.972	164649.463	Required	
S10	476866.427	164656.358	476866.427	164656.358	Required	
S6	476865.151	164644.967	476865.151	164644.967	Required	
S7	476859.785	164598.794	476859.785	164598.794	Required	
S8	476855.834	164560.698	476855.834	164560.698	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S	476876.735	164536.695			No Entry	

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)
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S1.008	S	57.950	56.964	0.000	0	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 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.303
Return Period (years)	2	F (1km)	2.642
FEH Rainfall Version	1999	Summer Storms	Yes
Site Location	GB 476550 165050 SU 76550 65050	Winter Storms	Yes
C (1km)	-0.028	Cv (Summer)	0.750
D1 (1km)	0.261	Cv (Winter)	0.840
D2 (1km)	0.255	Storm Duration (mins)	30
D3 (1km)	0.327		

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Coombe House Coombe Square Thatcham, RG19 4JF	FINCHWOOD PARK PARCEL 8 SURFACE WATER DRAINAGE CALCS	
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File 6860 - Drainage Design MM 14032...	Checked by MAS	
Innovyze	Network 2020.1.3	

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 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH D3 (1km) 0.327
 FEH Rainfall Version 1999 E (1km) 0.303
 Site Location GB 476550 165050 SU 76550 65050 F (1km) 2.642
 C (1km) -0.028 Cv (Summer) 0.750
 D1 (1km) 0.261 Cv (Winter) 0.840
 D2 (1km) 0.255

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

Profile(s)

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, 40

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 (m ³)
S1.000	S1	15 Summer	1	+0%	100/15 Summer				58.429	-0.125	0.000
S1.001	S2	15 Winter	1	+0%	100/15 Summer				58.298	-0.172	0.000
S1.002	S3	15 Winter	1	+0%	30/600 Winter				58.226	-0.159	0.000
S4.003	S9	15 Winter	1	+0%	30/720 Winter				58.227	-0.180	0.000
S1.003	S4	15 Winter	1	+0%	30/360 Winter				58.084	-0.214	0.000
S1.004	S5	960 Winter	1	+0%	30/120 Winter				57.932	-0.283	0.000
S15.002	S10	180 Winter	1	+0%	30/120 Winter				57.966	-0.210	0.000
S1.005	S6	960 Winter	1	+0%	30/120 Summer				57.932	-0.175	0.000
S1.007	S7	960 Winter	1	+0%					57.580	-0.120	0.000
S1.008	S8	480 Winter	1	+0%					57.185	-0.115	0.000

Half Drain Pipe

PN	US/MH Name	Flow / Overflow Cap.	Time (mins)	Flow (l/s)	Level Exceeded
S1.000	S1	0.07		1.6	OK
S1.001	S2	0.12		4.4	OK
S1.002	S3	0.19		6.6	OK
S4.003	S9	0.09		3.1	OK
S1.003	S4	0.18		11.3	OK
S1.004	S5	0.02		2.7	OK
S15.002	S10	0.01		0.5	OK
S1.005	S6	0.03		3.3	OK
S1.007	S7	0.09		1.6	OK
S1.008	S8	0.12		1.6	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 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH D3 (1km) 0.327
 FEH Rainfall Version 1999 E (1km) 0.303
 Site Location GB 476550 165050 SU 76550 65050 F (1km) 2.642
 C (1km) -0.028 Cv (Summer) 0.750
 D1 (1km) 0.261 Cv (Winter) 0.840
 D2 (1km) 0.255

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

Profile(s)

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, 40

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 (m ³)
S1.000	S1	15 Winter	30	+0%	100/15 Summer				58.450	-0.104	0.000
S1.001	S2	720 Winter	30	+0%	100/15 Summer				58.411	-0.059	0.000
S1.002	S3	720 Winter	30	+0%	30/600 Winter				58.410	0.025	0.000
S4.003	S9	720 Winter	30	+0%	30/720 Winter				58.411	0.004	0.000
S1.003	S4	720 Winter	30	+0%	30/360 Winter				58.410	0.112	0.000
S1.004	S5	720 Winter	30	+0%	30/120 Winter				58.409	0.194	0.000
S15.002	S10	720 Winter	30	+0%	30/120 Winter				58.408	0.232	0.000
S1.005	S6	720 Winter	30	+0%	30/120 Summer				58.409	0.302	0.000
S1.007	S7	15 Summer	30	+0%					57.580	-0.120	0.000
S1.008	S8	15 Summer	30	+0%					57.185	-0.115	0.000

PN	US/MH Name	Flow / Cap.	Half Drain / Overflow (l/s)	Pipe Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.21			5.2	OK	
S1.001	S2	0.04			1.3	OK	
S1.002	S3	0.05			1.7	SURCHARGED	
S4.003	S9	0.04			1.4	SURCHARGED	
S1.003	S4	0.05			3.4	SURCHARGED	
S1.004	S5	0.04			5.4	SURCHARGED	
S15.002	S10	0.02			0.6	SURCHARGED	
S1.005	S6	0.06			6.5	SURCHARGED	
S1.007	S7	0.09			1.6	OK	
S1.008	S8	0.12			1.6	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 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH D3 (1km) 0.327
 FEH Rainfall Version 1999 E (1km) 0.303
 Site Location GB 476550 165050 SU 76550 65050 F (1km) 2.642
 C (1km) -0.028 Cv (Summer) 0.750
 D1 (1km) 0.261 Cv (Winter) 0.840
 D2 (1km) 0.255

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

Profile(s)

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, 40

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 (m ³)
S1.000	S1	240 Winter	100	+40%	100/15 Summer				58.887	0.333	0.000
S1.001	S2	240 Winter	100	+40%	100/15 Summer				58.887	0.417	0.000
S1.002	S3	240 Winter	100	+40%	30/600 Winter				58.887	0.502	0.000
S4.003	S9	240 Winter	100	+40%	30/720 Winter				58.885	0.478	0.000
S1.003	S4	240 Winter	100	+40%	30/360 Winter				58.886	0.588	0.000
S1.004	S5	240 Winter	100	+40%	30/120 Winter				58.885	0.670	0.000
S15.002	S10	240 Winter	100	+40%	30/120 Winter				58.883	0.707	0.000
S1.005	S6	240 Winter	100	+40%	30/120 Summer				58.885	0.778	0.000
S1.007	S7	240 Winter	100	+40%					57.583	-0.117	0.000
S1.008	S8	240 Winter	100	+40%					57.188	-0.112	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.05			1.2	SURCHARGED	
S1.001	S2	0.13			4.5	SURCHARGED	
S1.002	S3	0.19			6.5	SURCHARGED	
S4.003	S9	0.10			3.7	SURCHARGED	
S1.003	S4	0.17			10.7	SURCHARGED	
S1.004	S5	0.10			15.8	SURCHARGED	
S15.002	S10	0.03			0.9	SURCHARGED	
S1.005	S6	0.22			21.9	SURCHARGED	
S1.007	S7	0.11			1.9	OK	
S1.008	S8	0.15			1.9	OK	