STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for REV A.SWS

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 (%)	10
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	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)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for REV A.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.030	4-8	0.013

Total Area Contributing (ha) = 0.043

Total Pipe Volume (m³) = 5.595

Network Design Table for REV A.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	14.547	0.182	79.9	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	13.954	0.416	33.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	11.052	0.138	80.1	0.000	5.00	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	5.22	89.010	0.008	0.0	0.0	0.1	1.13	19.9	1.2
1.001	50.00	5.35	88.828	0.008	0.0	0.0	0.1	1.74	30.8	1.2
2.000	50.00	5.16	88.550	0.000	0.0	0.0	0.0	1.12	19.9	0.0

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Network Design Table for REV A.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
1.002	12.731	0.127	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	35.053	0.351	99.9	0.017	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	12.252	0.123	99.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	6.854	0.073	93.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	7.596	0.052	146.1	0.004	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	8.304	0.057	145.7	0.002	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.000	21.837	0.218	100.2	0.006	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	11.403	0.114	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.002	9.566	0.364	26.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	11.456	0.116	98.8	0.006	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.003	4.794	0.253	18.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	15.836	0.641	24.7	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)
1.002	50.00	5.56	88.412	0.008	0.0	0.0	0.1	1.00	17.7	1.2
1.003	50.00	6.14	88.285	0.025	0.0	0.0	0.3	1.01	17.8	3.7
1.004	50.00	6.27	87.784	0.025	0.0	0.0	0.3	1.58	111.4	3.7
1.005	50.00	6.34	87.661	0.025	0.0	0.0	0.3	1.62	114.7	3.7
3.000	50.00	5.10	87.640	0.004	0.0	0.0	0.1	1.30	91.8	0.6
1.006	50.00	6.45	87.588	0.031	0.0	0.0	0.4	1.30	91.9	4.6
4.000	50.00	5.36	88.630	0.006	0.0	0.0	0.1	1.00	17.7	0.9
4.001	50.00	5.55	88.412	0.006	0.0	0.0	0.1	1.00	17.8	0.9
4.002	50.00	5.63	88.298	0.006	0.0	0.0	0.1	1.97	34.8	0.9
5.000	50.00	5.19	88.050	0.006	0.0	0.0	0.1	1.01	17.9	0.9
4.003	50.00	5.65	87.784	0.012	0.0	0.0	0.2	3.63	256.5	1.8
1.007	50.00	6.58	87.531	0.043	0.0	0.0	0.6	2.03	35.9	6.4

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Manhole Schedules for REV A.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SW01	89.760	0.750	Open Manhole	600	1.000	89.010	150				
SW04a	89.670	0.842	Open Manhole	600	1.001	88.828	150	1.000	88.828	150	
SW05b	89.310	0.760	Open Manhole	600	2.000	88.550	150				
SW05	89.410	0.998	Open Manhole	600	1.002	88.412	150	1.001	88.412	150	
								2.000	88.412	150	
SW01	89.270	0.985	Open Manhole	1350	1.003	88.285	150	1.002	88.285	150	
SW02	89.300	1.516	Open Manhole	1350	1.004	87.784	300	1.003	87.934	150	
SW03	89.560	1.899	Open Manhole	1350	1.005	87.661	300	1.004	87.661	300	
SW06	89.350	1.710	Open Manhole	1500	3.000	87.640	300				
SW07	89.350	1.762	Open Manhole	1500	1.006	87.588	300	1.005	87.588	300	
								3.000	87.588	300	
SW08a	89.280	0.650	Open Manhole	600	4.000	88.630	150				
SW09	89.380	0.968	Open Manhole	600	4.001	88.412	150	4.000	88.412	150	
SW10	89.300	1.002	Open Manhole	600	4.002	88.298	150	4.001	88.298	150	
SW11	89.300	1.250	Open Manhole	600	5.000	88.050	150				
SW12	89.350	1.566	Open Manhole	1500	4.003	87.784	300	4.002	87.934	150	
								5.000	87.934	150	
SW13	89.440	1.909	Open Manhole	1500	1.007	87.531	150	1.006	87.531	300	
								4.003	87.531	300	
9	88.790	1.900	Open Manhole	0		OUTFALL		1.007	86.890	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW01	386803.048	402145.238	386803.048	402145.238	Required	
SW04a	386817.315	402142.398	386817.315	402142.398	Required	
SW05b	386812.319	402117.898	386812.319	402117.898	Required	

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Manhole Schedules for REV A.SWS

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW05	386814.637	402128.704	386814.637	402128.704	Required	
SW01	386802.175	402131.309	386802.175	402131.309	Required	
SW02	386795.592	402096.879	386795.592	402096.879	Required	
SW03	386807.592	402094.407	386807.592	402094.407	Required	
SW06	386810.260	402108.608	386810.260	402108.608	Required	
SW07	386808.926	402101.130	386808.926	402101.130	Required	
SW08a	386828.209	402082.610	386828.209	402082.610	Required	
SW09	386836.005	402103.009	386836.005	402103.009	Required	
SW10	386825.291	402106.910	386825.291	402106.910	Required	
SW11	386817.477	402087.394	386817.477	402087.394	Required	
SW12	386821.658	402098.060	386821.658	402098.060	Required	
SW13	386816.997	402099.179	386816.997	402099.179	Required	
9	386819.884	402114.750			No Entry	

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PIPELINE SCHEDULES for REV A.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	SW01	89.760	89.010	0.600	Open Manhole	600
1.001	o	150	SW04a	89.670	88.828	0.692	Open Manhole	600
2.000	o	150	SW05b	89.310	88.550	0.610	Open Manhole	600
1.002	o	150	SW05	89.410	88.412	0.848	Open Manhole	600
1.003	o	150	SW01	89.270	88.285	0.835	Open Manhole	1350
1.004	o	300	SW02	89.300	87.784	1.216	Open Manhole	1350
1.005	o	300	SW03	89.560	87.661	1.599	Open Manhole	1350
3.000	o	300	SW06	89.350	87.640	1.410	Open Manhole	1500
1.006	o	300	SW07	89.350	87.588	1.462	Open Manhole	1500
4.000	o	150	SW08a	89.280	88.630	0.500	Open Manhole	600
4.001	o	150	SW09	89.380	88.412	0.818	Open Manhole	600
4.002	o	150	SW10	89.300	88.298	0.852	Open Manhole	600

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	14.547	79.9	SW04a	89.670	88.828	0.692	Open Manhole	600
1.001	13.954	33.5	SW05	89.410	88.412	0.848	Open Manhole	600
2.000	11.052	80.1	SW05	89.410	88.412	0.848	Open Manhole	600
1.002	12.731	100.2	SW01	89.270	88.285	0.835	Open Manhole	1350
1.003	35.053	99.9	SW02	89.300	87.934	1.216	Open Manhole	1350
1.004	12.252	99.6	SW03	89.560	87.661	1.599	Open Manhole	1350
1.005	6.854	93.9	SW07	89.350	87.588	1.462	Open Manhole	1500
3.000	7.596	146.1	SW07	89.350	87.588	1.462	Open Manhole	1500
1.006	8.304	145.7	SW13	89.440	87.531	1.609	Open Manhole	1500
4.000	21.837	100.2	SW09	89.380	88.412	0.818	Open Manhole	600
4.001	11.403	100.0	SW10	89.300	88.298	0.852	Open Manhole	600
4.002	9.566	26.3	SW12	89.350	87.934	1.266	Open Manhole	1500

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PIPELINE SCHEDULES for REV A.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.000	o	150	SW11	89.300	88.050	1.100	Open Manhole	600
4.003	o	300	SW12	89.350	87.784	1.266	Open Manhole	1500
1.007	o	150	SW13	89.440	87.531	1.759	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.000	11.456	98.8	SW12	89.350	87.934	1.266	Open Manhole	1500
4.003	4.794	18.9	SW13	89.440	87.531	1.609	Open Manhole	1500
1.007	15.836	24.7	9	88.790	86.890	1.750	Open Manhole	0

Free Flowing Outfall Details for REV A.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	9	88.790	86.890	0.000	0	0

Simulation Criteria for REV A.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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	Region	England and Wales
Return Period (years)	2	M5-60 (mm)	18.000

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Synthetic Rainfall Details

Ratio R	0.360	Cv (Winter)	0.840
Profile Type	Summer	Storm Duration (mins)	30
Cv (Summer)	0.750		

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Online Controls for REV A.SWS

Hydro-Brake® Optimum Manhole: SW13, DS/PN: 1.007, Volume (m³): 4.1

Unit Reference	MD-SHE-0100-5000-1400-5000
Design Head (m)	1.400
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	87.531
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.0	Kick-Flo®	0.855	4.0
Flush-Flo™	0.416	5.0	Mean Flow over Head Range	-	4.4

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	3.3	1.200	4.7	3.000	7.1	7.000	10.7
0.200	4.6	1.400	5.0	3.500	7.7	7.500	11.0
0.300	4.9	1.600	5.3	4.000	8.2	8.000	11.4
0.400	5.0	1.800	5.6	4.500	8.6	8.500	11.7
0.500	5.0	2.000	5.9	5.000	9.1	9.000	12.0
0.600	4.9	2.200	6.2	5.500	9.5	9.500	12.3
0.800	4.3	2.400	6.4	6.000	9.9		
1.000	4.3	2.600	6.7	6.500	10.3		

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Summary of Critical Results by Maximum Level (Rank 1) for REV A.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
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 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 Ratio R 0.345
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.300 Cv (Winter) 1.000

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, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW01	15 Summer	100	+45%					89.070
1.001	SW04a	15 Summer	100	+45%					88.876
2.000	SW05b	60 Summer	100	+45%					88.552
1.002	SW05	60 Summer	100	+45%					88.554
1.003	SW01	60 Summer	100	+45%	100/15 Summer				88.551
1.004	SW02	60 Summer	100	+45%	100/15 Summer				88.534
1.005	SW03	60 Summer	100	+45%	100/15 Summer				88.532
3.000	SW06	60 Summer	100	+45%	30/30 Summer				88.531
1.006	SW07	60 Summer	100	+45%	30/15 Summer				88.531
4.000	SW08a	15 Summer	100	+45%					88.684
4.001	SW09	60 Summer	100	+45%					88.534
4.002	SW10	60 Summer	100	+45%	100/30 Summer				88.532
5.000	SW11	60 Summer	100	+45%	100/15 Summer				88.532
4.003	SW12	60 Summer	100	+45%	100/15 Summer				88.530
1.007	SW13	60 Summer	100	+45%	1/15 Summer				88.529

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Summary of Critical Results by Maximum Level (Rank 1) for REV A.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	-0.090	0.000	0.34		6.2	OK	
1.001	SW04a	-0.102	0.000	0.22		6.1	OK	
2.000	SW05b	-0.148	0.000	0.00		0.0	OK	
1.002	SW05	-0.008	0.000	0.26		4.2	OK	
1.003	SW01	0.116	0.000	0.77		13.3	SURCHARGED	
1.004	SW02	0.450	0.000	0.12		10.4	SURCHARGED	
1.005	SW03	0.571	0.000	0.11		7.2	SURCHARGED	
3.000	SW06	0.591	0.000	0.01		0.7	SURCHARGED	
1.006	SW07	0.643	0.000	0.09		5.3	SURCHARGED	
4.000	SW08a	-0.096	0.000	0.27		4.6	OK	
4.001	SW09	-0.028	0.000	0.20		3.2	OK	
4.002	SW10	0.084	0.000	0.10		3.2	SURCHARGED	
5.000	SW11	0.332	0.000	0.20		3.2	SURCHARGED	
4.003	SW12	0.446	0.000	0.03		3.7	SURCHARGED	
1.007	SW13	0.848	0.000	0.15		4.9	SURCHARGED	

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Rainfall Hyetograph for 15 minute 100 year Summer I+45% for Pipe 1.000 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	41.473	4	62.364	7	280.637	10	141.798	13	51.950
2	45.602	5	82.762	8	435.561	11	82.762	14	45.602
3	51.949	6	141.798	9	280.638	12	62.364	15	41.473

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Rainfall Hyetograph for 15 minute 100 year Summer I+45% for Pipe 1.001 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	41.473	4	62.364	7	280.637	10	141.798	13	51.950
2	45.602	5	82.762	8	435.561	11	82.762	14	45.602
3	51.949	6	141.798	9	280.638	12	62.364	15	41.473

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 2.000 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 1.002 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 1.003 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 1.004 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 1.005 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 3.000 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 1.006 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 15 minute 100 year Summer I+45% for Pipe 4.000 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	41.473	4	62.364	7	280.637	10	141.798	13	51.950
2	45.602	5	82.762	8	435.561	11	82.762	14	45.602
3	51.949	6	141.798	9	280.638	12	62.364	15	41.473

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 4.001 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 4.002 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 5.000 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 4.003 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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Rainfall Hyetograph for 60 minute 100 year Summer I+45% for Pipe 1.007 (REV A.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2	17.565	12	23.456	22	51.302	32	189.251	42	39.521	52	21.688
4	18.475	14	25.705	24	71.920	34	140.733	44	32.399	54	20.242
6	19.386	16	28.489	26	103.140	36	103.140	46	28.489	56	19.386
8	20.242	18	32.399	28	140.733	38	71.920	48	25.705	58	18.475
10	21.688	20	39.521	30	189.251	40	51.302	50	23.456	60	17.565

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