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Spring Lodge 172 Chester Road Helsby Cheshire WA6 0AR		
Date 01/01/0001 File SN1 APR 21.MDX		
Designed by mrayner Checked by		
Micro Drainage		Network 2017.1.2

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SN1.SWS

Pipe Sizes SN1 Manhole Sizes SN1

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.200	Add Flow / Climate Change (%)	0
Ratio R	0.295	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	250	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)	400

Designed with Level Soffits

Network Design Table for SN1.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
S1.000	28.797	0.072	400.0	0.100	5.00	0.0	0.600	o	1500	Pipe/Conduit	
S1.001	51.828	0.130	398.7	0.074	0.00	0.0	0.600	o	1500	Pipe/Conduit	
S1.002	34.220	0.489	70.0	0.123	0.00	0.0	0.600	o	1500	Pipe/Conduit	
S1.003	11.467	0.253	45.3	0.082	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	52.929	0.132	401.0	0.110	0.00	0.0	0.600	[]	-3	Pipe/Conduit	
S1.005	20.409	0.204	100.0	0.044	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	62.594	0.626	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	55.612	0.556	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	48.657	0.487	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.009	49.199	0.492	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.010	8.139	0.081	100.0	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)
S1.000	56.70	5.22	76.691	0.100	0.0	0.0	0.0	2.14	3779.3	15.4
S1.001	55.07	5.63	76.619	0.174	0.0	0.0	0.0	2.14	3785.4	26.0
S1.002	57.18	5.11	76.489	0.000	5.0	0.0	0.0	5.13	9066.9	5.0
S1.003	56.64	5.24	76.000	0.082	5.0	0.0	0.0	1.50	26.5	17.6
S1.004	54.94	5.66	73.178	0.192	5.0	0.0	0.0	2.08	4499.5	33.6
S1.005	56.22	5.34	73.046	0.000	5.0	0.0	0.0	1.00	17.8	5.0
S1.006	52.33	6.38	72.842	0.000	5.0	0.0	0.0	1.00	17.8	5.0
S1.007	49.38	7.30	72.216	0.000	5.0	0.0	0.0	1.00	17.8	5.0
S1.008	47.12	8.11	71.660	0.000	5.0	0.0	0.0	1.00	17.8	5.0
S1.009	45.07	8.92	71.173	0.000	5.0	0.0	0.0	1.00	17.8	5.0
S1.010	44.75	9.06	70.681	0.000	5.0	0.0	0.0	1.00	17.8	5.0

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Micro Drainage										Network 2017.1.2	
<u>Manhole Schedules for SN1.SWS</u>											
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	80.871	4.180	Open Manhole	3000	S1.000	76.691	1500				
S2	80.640	4.021	Open Manhole	3000	S1.001	76.619	1500	S1.000	76.619	1500	
S3	79.189	2.700	Open Manhole	3000	S1.002	76.489	1500	S1.001	76.489	1500	
S4	78.231	2.231	Open Manhole	1500	S1.003	76.000	150	S1.002	76.000	1500	
S5	77.816	4.638	Open Manhole	3000	S1.004	73.178	-3	S1.003	75.747	150	1519
S6	75.446	2.400	Open Manhole	3000	S1.005	73.046	150	S1.004	73.046	-3	
S7	74.922	2.080	Open Manhole	1200	S1.006	72.842	150	S1.005	72.842	150	
S8	74.125	1.909	Open Manhole	1200	S1.007	72.216	150	S1.006	72.216	150	
S9	73.404	1.744	Open Manhole	1200	S1.008	71.660	150	S1.007	71.660	150	
S10	72.684	1.511	Open Manhole	1500	S1.009	71.173	150	S1.008	71.173	150	
S11	72.968	2.287	Open Manhole	1200	S1.010	70.681	150	S1.009	70.681	150	
S12	72.595	1.995	Open Manhole	2000		OUTFALL		S1.010	70.600	150	
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PIPELINE SCHEDULES for SN1.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)
S1.000	o	1500	S1	80.871	76.691	2.680	Open Manhole	3000
S1.001	o	1500	S2	80.640	76.619	2.521	Open Manhole	3000
S1.002	o	1500	S3	79.189	76.489	1.200	Open Manhole	3000
S1.003	o	150	S4	78.231	76.000	2.081	Open Manhole	1500
S1.004	[]	-3	S5	77.816	73.178	3.438	Open Manhole	3000
S1.005	o	150	S6	75.446	73.046	2.250	Open Manhole	3000
S1.006	o	150	S7	74.922	72.842	1.930	Open Manhole	1200
S1.007	o	150	S8	74.125	72.216	1.759	Open Manhole	1200
S1.008	o	150	S9	73.404	71.660	1.594	Open Manhole	1200
S1.009	o	150	S10	72.684	71.173	1.361	Open Manhole	1500
S1.010	o	150	S11	72.968	70.681	2.137	Open Manhole	1200

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)
S1.000	28.797	400.0	S2	80.640	76.619	2.521	Open Manhole	3000
S1.001	51.828	398.7	S3	79.189	76.489	1.200	Open Manhole	3000
S1.002	34.220	70.0	S4	78.231	76.000	0.731	Open Manhole	1500
S1.003	11.467	45.3	S5	77.816	75.747	1.919	Open Manhole	3000
S1.004	52.929	401.0	S6	75.446	73.046	1.200	Open Manhole	3000
S1.005	20.409	100.0	S7	74.922	72.842	1.930	Open Manhole	1200
S1.006	62.594	100.0	S8	74.125	72.216	1.759	Open Manhole	1200
S1.007	55.612	100.0	S9	73.404	71.660	1.594	Open Manhole	1200
S1.008	48.657	100.0	S10	72.684	71.173	1.361	Open Manhole	1500
S1.009	49.199	100.0	S11	72.968	70.681	2.137	Open Manhole	1200
S1.010	8.139	100.0	S12	72.595	70.600	1.845	Open Manhole	2000

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for SN1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /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	2	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	0.300
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	260.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)

Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 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)
S1.000	S1	120 Winter	2	+0%					76.993
S1.001	S2	120 Winter	2	+0%	100/360 Winter				76.993
S1.002	S3	120 Winter	2	+0%	100/240 Winter				76.993
S1.003	S4	15 Winter	2	+0%	30/15 Summer				76.084
S1.004	S5	480 Winter	2	+0%	100/120 Winter				73.678
S1.005	S6	480 Winter	2	+0%	2/15 Summer				73.678
S1.006	S7	30 Winter	2	+0%					72.889
S1.007	S8	30 Winter	2	+0%					72.263
S1.008	S9	30 Winter	2	+0%					71.707
S1.009	S10	30 Winter	2	+0%					71.220
S1.010	S11	30 Winter	2	+0%					70.731

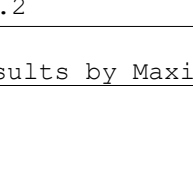
Surcharged Flooded					Pipe		Level	
PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Exceeded
S1.000	S1	-1.198	0.000	0.00		4.6	OK	
S1.001	S2	-1.126	0.000	0.00		5.6	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SN1.SWS			
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 2 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 0.300			
Region England and Wales Cv (Summer) 0.750			
M5-60 (mm) 19.000 Cv (Winter) 0.840			
Margin for Flood Risk Warning (mm) 260.0			
Analysis Timestep 2.5 Second Increment (Extended)			
DTS Status ON			
DVD Status OFF			
Inertia Status OFF			
Profile(s) Summer and Winter			
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440			
Return Period(s) (years) 2, 30, 100			
Climate Change (%) 0, 0, 40			
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for SN1.SWS

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow	Pipe	Status	Level
		Level (m)	Depth (m)	Volume (m³)		(l/s)	Flow (l/s)		Exceeded
S1.002	S3	77.351	-0.638	0.000	0.00		3.4	OK	
S1.003	S4	76.188	0.038	0.000	1.08		25.9	SURCHARGED	
S1.004	S5	74.278	-0.100	0.000	0.00		6.8	OK	
S1.005	S6	74.277	1.081	0.000	0.22		3.7	SURCHARGED	
S1.006	S7	72.889	-0.103	0.000	0.21		3.7	OK	
S1.007	S8	72.263	-0.103	0.000	0.21		3.7	OK	
S1.008	S9	71.707	-0.103	0.000	0.22		3.7	OK	
S1.009	S10	71.220	-0.103	0.000	0.22		3.7	OK	
S1.010	S11	70.731	-0.100	0.000	0.24		3.7	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SN1.SWS

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 2	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 0.300
Region England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000 Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	260.0
Analysis Timestep 2.5 Second Increment (Extended)	
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440	Summer and Winter
Return Period(s) (years)	2, 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)
S1.000	S1	360 Winter	100	+40%					78.125
S1.001	S2	360 Winter	100	+40%	100/360 Winter				78.125
S1.002	S3	360 Winter	100	+40%	100/240 Winter				78.126
S1.003	S4	15 Winter	100	+40%	30/15 Summer				76.393
S1.004	S5	960 Winter	100	+40%	100/120 Winter				75.387
S1.005	S6	960 Winter	100	+40%	2/15 Summer				75.387
S1.006	S7	960 Winter	100	+40%					72.896
S1.007	S8	960 Winter	100	+40%					72.270
S1.008	S9	960 Winter	100	+40%					71.714
S1.009	S10	960 Winter	100	+40%					71.228
S1.010	S11	960 Winter	100	+40%					70.739

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.066	0.000	0.00		7.8	OK	
S1.001	S2	0.006	0.000	0.00		6.4	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SN1.SWS

		Surcharged	Flooded			Pipe		
	US/MH	Depth	Volume	Flow /	Overflow	Flow		Level
PN	Name	(m)	(m³)	Cap.	(l/s)	(l/s)	Status	Exceeded
S1.002	S3	0.137	0.000	0.00		4.0	SURCHARGED	
S1.003	S4	0.243	0.000	1.41		33.6	SURCHARGED	
S1.004	S5	1.009	0.000	0.00		11.2	SURCHARGED	
S1.005	S6	2.191	0.000	0.30		4.9	FLOOD RISK	
S1.006	S7	-0.096	0.000	0.28		4.9	OK	
S1.007	S8	-0.096	0.000	0.28		4.9	OK	
S1.008	S9	-0.096	0.000	0.29		4.9	OK	
S1.009	S10	-0.096	0.000	0.29		4.9	OK	
S1.010	S11	-0.092	0.000	0.32		4.9	OK	