

RSK LDE											Page 2
Spring Lodge 172 Chester Road Helsby Cheshire WA6 0AR											
Date 01/01/0001 File SN1.MDX											
Designed by APeet Checked by											
Micro Drainage						Network 2019.1					
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
S5.001	38.138	0.231	165.0	0.092	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.002	20.782	0.126	165.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.003	17.242	0.104	165.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.004	7.974	0.048	165.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.005	63.655	1.286	49.5	0.084	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.006	42.723	0.107	400.0	0.153	0.00	0.0	0.600	o	900	Pipe/Conduit	
S6.000	37.109	0.247	150.2	0.167	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	11.100	0.067	165.0	0.046	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.002	57.357	1.329	43.2	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.007	17.193	0.043	400.0	0.059	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.011	26.125	0.065	400.0	0.135	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.012	39.441	0.099	400.0	0.109	0.00	0.0	0.600	o	900	Pipe/Conduit	
S7.000	56.704	0.656	86.4	0.104	5.00	0.0	0.600	o	225	Pipe/Conduit	
S7.001	79.479	0.199	399.4	0.260	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.013	8.971	0.022	400.0	0.000	0.00	0.0	0.600	o	900	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)	
S5.001	53.31	6.59	30.810	0.209	0.0	0.0	0.0	1.02	40.4	30.2	
S5.002	52.08	6.93	30.579	0.209	0.0	0.0	0.0	1.02	40.4	30.2	
S5.003	51.11	7.21	30.453	0.209	0.0	0.0	0.0	1.02	40.4	30.2	
S5.004	50.68	7.34	30.348	0.209	0.0	0.0	0.0	1.02	40.4	30.2	
S5.005	48.89	7.91	30.300	0.293	0.0	0.0	0.0	1.86	74.1	38.8	
S5.006	47.56	8.37	28.339	0.446	0.0	0.0	0.0	1.56	992.7	57.4	
S6.000	57.37	5.58	30.550	0.167	0.0	0.0	0.0	1.06	42.3	25.9	
S6.001	56.58	5.76	30.303	0.213	0.0	0.0	0.0	1.02	40.4	32.6	
S6.002	54.62	6.24	30.236	0.237	0.0	0.0	0.0	2.00	79.4	35.1	
S5.007	47.04	8.55	28.232	0.742	0.0	0.0	0.0	1.56	992.7	94.5	
S1.011	42.04	10.63	28.189	1.715	0.0	0.0	0.0	1.56	992.7	195.3	
S1.012	41.17	11.05	28.123	1.824	0.0	0.0	0.0	1.56	992.7	203.4	
S7.000	56.97	5.67	31.055	0.104	0.0	0.0	0.0	1.41	56.0	16.0	
S7.001	53.56	6.52	28.224	0.364	0.0	0.0	0.0	1.56	993.5	52.8	
S1.013	40.98	11.15	28.025	2.188	0.0	0.0	0.0	1.56	992.7	242.8	
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Micro Drainage					Network 2019.1						
Manhole Schedules for SN1.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	32.300	1.500	Open Manhole	2100	S1.000	30.800	225				
S2	32.425	1.706	Open Manhole	1350	S1.001	30.719	225	S1.000	30.719	225	
S3	33.207	2.878	Open Manhole	1350	S1.002	30.329	225	S1.001	30.329	225	
S4	33.163	2.931	Open Manhole	1350	S1.003	30.232	225	S1.002	30.232	225	
S5	32.716	1.500	Open Manhole	2100	S2.000	31.216	225				
S6	32.915	1.965	Open Manhole	1800	S2.001	30.950	225	S2.000	30.950	225	
S7	32.684	2.831	Open Manhole	1800	S1.004	29.853	300	S1.003	29.928	225	
								S2.001	29.928	225	
S8	32.609	2.897	Open Manhole	1350	S1.005	29.712	300	S1.004	29.712	300	
S9	32.475	2.810	Open Manhole	1350	S1.006	29.665	300	S1.005	29.665	300	
S10	32.825	4.250	Open Manhole	2100	S1.007	28.575	900	S1.006	29.175	300	
S11	33.083	4.568	Open Manhole	2400	S1.008	28.515	900	S1.007	28.515	900	
S12	32.355	1.425	Open Manhole	1500	S3.000	30.930	225				
S13	32.155	1.425	Open Manhole	1800	S4.000	30.730	225				
S14	32.597	2.098	Open Manhole	1500	S3.001	30.499	225	S3.000	30.499	225	
								S4.000	30.499	225	
S15	32.496	4.160	Open Manhole	2100	S1.009	28.336	900	S1.008	28.336	900	
								S3.001	30.396	225	1385
S16	31.969	3.747	Open Manhole	2400	S1.010	28.222	900	S1.009	28.222	900	
S17	33.093	1.893	Open Manhole	1800	S5.000	31.200	225				
S18	32.350	1.540	Open Manhole	1350	S5.001	30.810	225	S5.000	30.810	225	
S18	32.383	1.804	Open Manhole	1350	S5.002	30.579	225	S5.001	30.579	225	
S19	32.653	2.200	Open Manhole	1350	S5.003	30.453	225	S5.002	30.453	225	
S20	32.634	2.286	Open Manhole	1350	S5.004	30.348	225	S5.003	30.348	225	
S21	32.527	2.227	Open Manhole	1350	S5.005	30.300	225	S5.004	30.300	225	
S22	32.344	4.005	Open Manhole	2400	S5.006	28.339	900	S5.005	29.014	225	
S23	32.387	1.837	Open Manhole	2400	S6.000	30.550	225				
S24	32.319	2.016	Open Manhole	1500	S6.001	30.303	225	S6.000	30.303	225	
S25	32.450	2.214	Open Manhole	1350	S6.002	30.236	225	S6.001	30.236	225	
S26	32.450	4.218	Open Manhole	2400	S5.007	28.232	900	S5.006	28.232	900	
								S6.002	28.907	225	
S27	32.232	4.043	Open Manhole	2700	S1.011	28.189	900	S1.010	28.189	900	
								S5.007	28.189	900	
S28	32.100	3.977	Open Manhole	2400	S1.012	28.123	900	S1.011	28.123	900	
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Manhole Schedules for SN1.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)
S30	32.508	1.453	Open Manhole	1350	S7.000	31.055	225				
S31	31.921	3.697	Open Manhole	2400	S7.001	28.224	900	S7.000	30.399	225	1500
S32	32.370	4.345	Open Manhole	2700	S1.013	28.025	900	S1.012	28.025	900	
								S7.001	28.025	900	
S33	32.474	4.472	Open Manhole	2400	S1.014	28.002	300	S1.013	28.002	900	
S34	32.500	4.557	Open Manhole	0		OUTFALL		S1.014	27.943	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	382253.180	390126.870	382253.180	390126.870	Required	
S2	382243.952	390120.316	382243.952	390120.316	Required	
S3	382179.787	390125.746	382179.787	390125.746	Required	
S4	382171.758	390139.620	382171.758	390139.620	Required	
S5	382264.409	390210.746	382264.409	390210.746	Required	
S6	382262.067	390182.897	382262.067	390182.897	Required	
S7	382176.161	390189.583	382176.161	390189.583	Required	
S8	382141.706	390192.734	382141.706	390192.734	Required	
S9	382131.818	390198.338	382131.818	390198.338	Required	

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Micro Drainage Network 2019.1		
<u>Simulation Criteria for SN1.SWS</u> 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 1 Number of Storage Structures 1 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> 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) 18.000 Storm Duration (mins) 30 Ratio R 0.362		
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Online Controls for SN1.SWS

Hydro-Brake® Optimum Manhole: S33, DS/PN: S1.014, Volume (m³): 24.3

Unit Reference	MD-SHE-0239-4500-3950-4500
Design Head (m)	3.950
Design Flow (l/s)	45.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	239
Invert Level (m)	28.002
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.950	45.0	Kick-Flo®	2.137	33.5
Flush-Flo™	1.034	43.0	Mean Flow over Head Range	-	38.2

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	7.9	1.200	42.8	3.000	39.4	7.000	59.3
0.200	24.2	1.400	42.2	3.500	42.4	7.500	61.4
0.300	34.0	1.600	41.1	4.000	45.3	8.000	63.3
0.400	37.1	1.800	39.3	4.500	47.9	8.500	65.2
0.500	39.3	2.000	36.4	5.000	50.4	9.000	67.0
0.600	40.8	2.200	33.9	5.500	52.8	9.500	68.8
0.800	42.5	2.400	35.4	6.000	55.1		
1.000	43.0	2.600	36.8	6.500	57.2		

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SN1.SWS

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 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 Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Rainfall Model	FSR	Ratio R	0.362
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Analysis Timestep 2.5 Second Increment (Extended)

Return Period(s) (years) 2, 30, 100

									Water
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
S1.000	S1	15 Winter	2	+0%	100/15 Summer				30.899
S1.001	S2	15 Winter	2	+0%	100/15 Summer				30.834
S1.002	S3	15 Winter	2	+0%	30/15 Summer				30.445
S1.003	S4	15 Winter	2	+0%	30/15 Summer				30.365
S2.000	S5	15 Winter	2	+0%	100/15 Summer				31.287
S2.001	S6	15 Winter	2	+0%	100/15 Summer				31.058
S1.004	S7	15 Winter	2	+0%	30/15 Summer				30.047
S1.005	S8	15 Winter	2	+0%	30/15 Summer				29.924
S1.006	S9	15 Winter	2	+0%	30/30 Winter				29.833
S1.007	S10	60 Winter	2	+0%	30/30 Summer				28.808
S1.008	S11	60 Winter	2	+0%	30/30 Summer				28.807
S3.000	S12	15 Winter	2	+0%	100/15 Summer				30.995
S4.000	S13	15 Winter	2	+0%	100/15 Summer				30.815
S3.001	S14	15 Winter	2	+0%	30/15 Summer				30.639
S1.009	S15	60 Winter	2	+0%	30/30 Summer				28.806

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Network 2019.1

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.010	S16	60 Winter	2	+0%	30/15 Winter				28.805
S5.000	S17	15 Winter	2	+0%	30/15 Winter				31.307
S5.001	S18	15 Winter	2	+0%	30/15 Summer	100/15 Winter			30.958
S5.002	S18	15 Winter	2	+0%	30/15 Summer				30.729
S5.003	S19	15 Winter	2	+0%	30/15 Summer				30.603
S5.004	S20	15 Winter	2	+0%	30/15 Summer				30.517
S5.005	S21	15 Winter	2	+0%	30/60 Winter				30.414
S5.006	S22	60 Winter	2	+0%	30/30 Summer				28.805
S6.000	S23	15 Winter	2	+0%	30/15 Summer				30.683
S6.001	S24	15 Winter	2	+0%	30/15 Summer				30.472
S6.002	S25	15 Winter	2	+0%	30/60 Winter				30.342
S5.007	S26	60 Winter	2	+0%	30/15 Winter				28.804
S1.011	S27	60 Winter	2	+0%	30/15 Winter				28.804
S1.012	S28	60 Winter	2	+0%	30/15 Winter				28.801
S7.000	S30	15 Winter	2	+0%	100/30 Winter				31.140
S7.001	S31	60 Winter	2	+0%	30/15 Winter				28.797
S1.013	S32	60 Winter	2	+0%	30/15 Summer				28.797
S1.014	S33	60 Winter	2	+0%	2/15 Summer				28.796

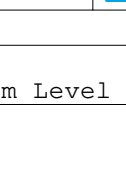
Surcharged			Flooded		Pipe		Level	
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.010	S16	-0.317	0.000	0.07		33.2	OK	
S5.000	S17	-0.118	0.000	0.43		17.5	OK	
S5.001	S18	-0.077	0.000	0.75		28.7	OK	3
S5.002	S18	-0.075	0.000	0.77		28.2	OK	
S5.003	S19	-0.074	0.000	0.78		28.2	OK	
S5.004	S20	-0.056	0.000	0.91		28.1	OK	
S5.005	S21	-0.111	0.000	0.51		36.3	OK	
S5.006	S22	-0.434	0.000	0.04		33.1	OK	
S6.000	S23	-0.092	0.000	0.64		25.5	OK	
S6.001	S24	-0.056	0.000	0.91		31.1	OK	
S6.002	S25	-0.119	0.000	0.45		34.3	OK	
S5.007	S26	-0.327	0.000	0.07		41.8	OK	
S1.011	S27	-0.285	0.000	0.10		74.1	OK	
S1.012	S28	-0.223	0.000	0.09		70.5	OK	
S7.000	S30	-0.140	0.000	0.30		16.3	OK	
S7.001	S31	-0.327	0.000	0.03		26.3	OK	
S1.013	S32	-0.128	0.000	0.10		42.2	OK	
S1.014	S33	0.494	0.000	0.72		42.4	SURCHARGED	

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

PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)					
S1.000	S1	-0.060	0.000	0.72		27.0	OK	
S1.001	S2	-0.015	0.000	0.92		35.9	OK	
S1.002	S3	0.294	0.000	0.37		13.3	SURCHARGED	
S1.003	S4	0.387	0.000	0.48		18.7	SURCHARGED	
S2.000	S5	-0.124	0.000	0.41		19.2	OK	
S2.001	S6	-0.028	0.000	0.93		51.5	OK	
S1.004	S7	0.682	0.000	0.57		36.9	SURCHARGED	
S1.005	S8	0.815	0.000	0.65		36.8	SURCHARGED	
S1.006	S9	0.857	0.000	0.49		48.4	SURCHARGED	
S1.007	S10	1.335	0.000	0.07		46.4	SURCHARGED	
S1.008	S11	1.394	0.000	0.05		39.3	SURCHARGED	
S3.000	S12	-0.133	0.000	0.35		27.4	OK	
S4.000	S13	-0.097	0.000	0.56		29.4	OK	
S3.001	S14	0.089	0.000	0.45		19.4	SURCHARGED	
S1.009	S15	1.574	0.000	0.05		37.5	SURCHARGED	

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.362
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	30 Winter	100	+40%	100/15 Summer				32.192
S1.001	S2	30 Winter	100	+40%	100/15 Summer				32.166
S1.002	S3	30 Winter	100	+40%	30/15 Summer				32.012
S1.003	S4	30 Winter	100	+40%	30/15 Summer				31.971
S2.000	S5	30 Winter	100	+40%	100/15 Summer				32.217
S2.001	S6	30 Winter	100	+40%	100/15 Summer				32.186
S1.004	S7	120 Winter	100	+40%	30/15 Summer				31.955
S1.005	S8	120 Winter	100	+40%	30/15 Summer				31.946
S1.006	S9	120 Winter	100	+40%	30/30 Winter				31.941
S1.007	S10	120 Winter	100	+40%	30/30 Summer				31.925
S1.008	S11	120 Winter	100	+40%	30/30 Summer				31.925
S3.000	S12	120 Winter	100	+40%	100/15 Summer				31.934
S4.000	S13	120 Winter	100	+40%	100/15 Summer				31.934
S3.001	S14	120 Winter	100	+40%	30/15 Summer				31.930
S1.009	S15	120 Winter	100	+40%	30/30 Summer				31.925

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Spring Lodge 172 Chester Road Helsby Cheshire WA6 0AR		
Date 01/01/0001 File SN1.MDX	Designed by APeet Checked by	
Micro Drainage	Network 2019.1	

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

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S1.000	S1	1.167	0.000	0.73		27.0	FLOOD RISK	
S1.001	S2	1.221	0.000	0.98		38.1	FLOOD RISK	
S1.002	S3	1.458	0.000	0.85		30.4	SURCHARGED	
S1.003	S4	1.514	0.000	1.16		45.1	SURCHARGED	
S2.000	S5	0.776	0.000	0.46		21.8	SURCHARGED	
S2.001	S6	1.012	0.000	1.00		55.3	SURCHARGED	
S1.004	S7	1.803	0.000	0.85		55.5	SURCHARGED	
S1.005	S8	1.934	0.000	0.95		53.5	SURCHARGED	
S1.006	S9	1.975	0.000	0.71		70.1	SURCHARGED	
S1.007	S10	2.450	0.000	0.09		59.8	SURCHARGED	
S1.008	S11	2.509	0.000	0.08		66.6	SURCHARGED	
S3.000	S12	0.779	0.000	0.21		16.7	SURCHARGED	
S4.000	S13	0.979	0.000	0.34		17.8	FLOOD RISK	
S3.001	S14	1.206	0.000	0.76		33.1	SURCHARGED	
S1.009	S15	2.688	0.000	0.13		104.6	SURCHARGED	

