ridehalgh nicholls consulting engineers	Ridehalgh Nicholls Consulting Storm Water Calcs	File: RNC-E366-FLOW-V03 SW. Network: Ridehalgh Nicholls Consulting 03/10/2025	Page 1 Surface Water Calcs V03 1 & 30 year +10% UC Storm Event

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	5.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	100.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	1.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.098	5.00	166.643	1200	450673.679	360683.055	1.515
S2	0.131	5.00	166.353	1200	450646.715	360694.772	1.572
S3	0.150	5.00	165.969	1500	450610.946	360710.316	1.679
S4	0.096	5.00	165.152	1500	450568.758	360728.649	1.487
S5	0.000		164.900		450558.187	360733.847	1.500
S6	0.039	5.00	164.900		450547.581	360712.315	1.500
S7	0.000		164.900	1800	450548.999	360707.688	1.525
S8	0.040	5.00	164.445	1200	450555.179	360700.446	1.140
EXC5602	0.000		164.568	1200	450545.796	360691.450	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	29.400	0.600	165.128	164.856	0.272	108.1	225	5.00	54.7
1.001	S2	S3	39.000	0.600	164.781	164.365	0.416	93.8	300	5.00	54.7
1.002	S3	S4	45.999	0.600	164.290	163.665	0.625	73.6	375	5.00	54.7
1.003	S4	S5	11.780	0.600	163.665	163.625	0.040	294.5	375	5.00	54.7
2.000	S6	S7	4.839	0.600	163.400	163.375	0.025	193.6	375	5.00	54.7
2.001	S7	S8	9.520	0.600	163.375	163.305	0.070	136.0	225	5.00	54.7
2.002	S8	EXC5602	12.999	0.600	163.305	163.218	0.087	149.4	225	5.00	54.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.257	50.0	14.5	1.290	1.272	0.098	0.0	83	1.094
1.001	1.624	114.8	34.0	1.272	1.304	0.229	0.0	112	1.421
1.002	2.114	233.5	56.2	1.304	1.112	0.379	0.0	125	1.752
1.003	1.050	116.0	70.4	1.112	0.900	0.475	0.0	211	1.099
2.000	1.298	143.4	5.8	1.125	1.150	0.039	0.0	51	0.644
2.001	1.119	44.5	5.8	1.300	0.915	0.039	0.0	55	0.780
2.002	1.067	42.4	11.7	0.915	1.125	0.079	0.0	80	0.913

Simulation Settings

Rainfall Methodology	FSR	Winter CV	0.840
Rainfall Events	Singular	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	1440
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Starting Level (m)	

Simulation Settings

Check Discharge Rate(s) x | Check Discharge Volume x

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0

Node S7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	163.375	Product Number	CTL-SHE-0089-3400-0925-3400
Design Depth (m)	0.925	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	3.4	Min Node Diameter (mm)	1200

Node S6 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	30.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	163.400	Main Channel Slope (1:X)	100000.0
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.030

Inlets

S5

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	223.7	0.0	1.000	491.6	0.0	1.400	614.6	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	165.210	0.082	13.8	0.1981	0.0000	OK
15 minute winter	S2	11	164.891	0.110	31.8	0.3068	0.0000	OK
15 minute winter	S3	11	164.408	0.118	51.9	0.4205	0.0000	OK
15 minute winter	S4	11	163.866	0.201	64.4	0.6155	0.0000	OK
240 minute winter	S5	188	163.609	0.208	13.5	0.0000	0.0000	OK
240 minute winter	S6	188	163.608	0.208	9.0	0.1083	0.0000	OK
240 minute winter	S7	188	163.609	0.234	8.6	0.5963	0.0000	SURCHARGED
15 minute winter	S8	11	163.372	0.067	7.8	0.1225	0.0000	OK
15 minute winter	EXC5602	11	163.281	0.063	7.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	13.4	1.057	0.267	0.3730	
15 minute winter	S2	1.001	S3	31.4	1.377	0.273	0.8884	
15 minute winter	S3	1.002	S4	51.7	1.166	0.221	2.0698	
15 minute winter	S4	1.003	S5	64.7	1.131	0.558	0.6741	
240 minute winter	S5	Flow through Pond	S6	7.9	0.021	0.006	52.5040	
240 minute winter	S6	2.000	S7	8.6	0.313	0.060	0.3273	
240 minute winter	S7	Hydro-Brake®	S8	3.4				
15 minute winter	S8	2.002	EXC5602	7.4	0.783	0.173	0.1231	35.5

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	165.269	0.141	33.9	0.3407	0.0000	OK
15 minute winter	S2	10	164.970	0.189	78.2	0.5291	0.0000	OK
15 minute winter	S3	11	164.484	0.194	128.0	0.6887	0.0000	OK
15 minute winter	S4	11	164.030	0.365	159.5	1.1152	0.0000	OK
360 minute winter	S5	352	163.905	0.504	22.3	0.0000	0.0000	OK
360 minute winter	S6	352	163.904	0.504	14.0	0.2623	0.0000	SURCHARGED
360 minute winter	S7	352	163.904	0.529	4.3	1.3472	0.0000	SURCHARGED
15 minute winter	S8	10	163.409	0.104	16.6	0.1911	0.0000	OK
15 minute winter	EXC5602	10	163.315	0.097	16.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	33.0	1.318	0.660	0.7393	
15 minute winter	S2	1.001	S3	77.0	1.712	0.671	1.7555	
15 minute winter	S3	1.002	S4	126.8	1.460	0.543	3.8373	
15 minute winter	S4	1.003	S5	159.6	1.556	1.376	1.1908	
360 minute winter	S5	Flow through Pond	S6	12.2	0.024	0.008	146.9745	
360 minute winter	S6	2.000	S7	4.3	0.258	0.030	0.5337	
360 minute winter	S7	Hydro-Brake®	S8	3.4				
15 minute winter	S8	2.002	EXC5602	16.6	0.968	0.391	0.2231	87.7