APPENDIX J – SURFACE WATER DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
s1	0.048	4.00	21.800	Manhole	1200	531168.357	190408.063	2.600
s2	0.228	4.00	20.800	Manhole	600	531201.111	190408.665	1.425
s3	0.044	4.00	21.300	Manhole	1200	531177.503	190396.707	2.156
CS1			20.800	Manhole	1	531177.490	190389.777	1.700
s4	0.094	4.00	20.800	Manhole	1200	531178.722	190387.058	1.863
CS2			20.600	Manhole	1	531188.521	190367.445	1.673
s5	0.028	4.00	20.600	Manhole	1200	531189.518	190365.477	1.683
s6	0.012	4.00	20.500	Manhole	1200	531192.685	190359.391	1.653
s7	0.139	4.00	20.010	Manhole	1200	531200.205	190355.048	1.075
CS3			20.010	Manhole	1	531201.298	190342.333	1.353
s8	0.045	4.00	20.300	Manhole	1200	531202.011	190340.927	1.648
2306			19.920	Manhole	1200	531211.097	190334.788	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)
2.000	s1	CS1	2.443	0.600	19.200	19.100	0.100	24.4	225	4.02	50.0
1.000	s2	s3	26.464	0.600	19.375	19.219	0.156	169.6	300	4.37	50.0
1.001	s3	CS1	6.930	0.600	19.144	19.100	0.044	157.5	375	4.45	50.0
1.002	CS1	s4	2.985	0.600	19.100	19.087	0.013	229.6	225	4.50	0.0
1.003	s4	CS2	2.427	0.600	18.937	18.927	0.010	242.7	225	4.55	50.0
1.004	CS2	s5	2.206	0.600	18.927	18.917	0.010	220.6	225	4.59	50.0
1.005	s5	s6	6.861	0.600	18.917	18.847	0.070	98.0	225	4.68	50.0
1.006	s6	CS3	1.109	0.600	18.847	18.807	0.040	27.7	225	4.69	50.0
3.000	s7	CS3	12.762	0.600	18.935	18.807	0.128	99.7	300	4.14	50.0
1.007	CS3	s8	1.576	0.600	18.657	18.652	0.005	315.3	300	4.72	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
2.000	s1	CS1	2.658	105.7	8.2	2.375	1.475	1.475	2.375	0.048	0.0
1.000	s2	s3	1.204	85.1	39.1	1.125	1.781	1.125	1.781	0.228	0.0
1.001	s3	CS1	1.441	159.1	46.7	1.781	1.325	1.325	1.781	0.272	0.0
1.002	CS1	s4	0.858	34.1	0.0	1.475	1.488	1.475	1.488	0.320	0.0
1.003	s4	CS2	0.835	33.2	71.1	1.638	1.448	1.448	1.638	0.414	0.0
1.004	CS2	s5	0.876	34.8	71.1	1.448	1.458	1.448	1.458	0.414	0.0
1.005	s5	s6	1.320	52.5	75.9	1.458	1.428	1.428	1.458	0.442	0.0
1.006	s6	CS3	2.494	99.2	77.9	1.428	0.978	0.978	1.428	0.454	0.0
3.000	s7	CS3	1.574	111.3	23.9	0.775	0.903	0.775	0.903	0.139	0.0
1.007	CS3	s8	0.880	62.2	101.8	1.053	1.348	1.053	1.348	0.593	0.0

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)
1.008	s8	2306	10.966	0.600	18.652	18.570	0.082	133.7	150	4.93	0.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.008	s8	2306	0.867	15.3	0.0	1.498	1.200	1.200	1.498	0.638	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	2.443	24.4	225	21.800	19.200	2.375	20.800	19.100	1.475
1.000	26.464	169.6	300	20.800	19.375	1.125	21.300	19.219	1.781
1.001	6.930	157.5	375	21.300	19.144	1.781	20.800	19.100	1.325
1.002	2.985	229.6	225	20.800	19.100	1.475	20.800	19.087	1.488
1.003	2.427	242.7	225	20.800	18.937	1.638	20.600	18.927	1.448
1.004	2.206	220.6	225	20.600	18.927	1.448	20.600	18.917	1.458
1.005	6.861	98.0	225	20.600	18.917	1.458	20.500	18.847	1.428
1.006	1.109	27.7	225	20.500	18.847	1.428	20.010	18.807	0.978
3.000	12.762	99.7	300	20.010	18.935	0.775	20.010	18.807	0.903
1.007	1.576	315.3	300	20.010	18.657	1.053	20.300	18.652	1.348
1.008	10.966	133.7	150	20.300	18.652	1.498	19.920	18.570	1.200

Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	MH Type
2.000	s1	1200	Manhole	CS1	1	1
1.000	s2	600	Manhole	s3	1200	1
1.001	s3	1200	Manhole	CS1	1	1
1.002	CS1	1	Manhole	s4	1200	1
1.003	s4	1200	Manhole	CS2	1	1
1.004	CS2	1	Manhole	s5	1200	1
1.005	s5	1200	Manhole	s6	1200	1
1.006	s6	1200	Manhole	CS3	1	1
3.000	s7	1200	Manhole	CS3	1	1
1.007	CS3	1	Manhole	s8	1200	1
1.008	s8	1200	Manhole	2306	1200	1

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	Connections	Link	IL (m)	Dia (mm)
s1	531168.357	190408.063	21.800	2.600	1200	Manhole	 0	2.000	19.200	225
s2	531201.111	190408.665	20.800	1.425	600	Manhole	 0	1.000	19.375	300
s3	531177.503	190396.707	21.300	2.156	1200	Manhole	1  0	1.000 1.001	19.219 19.144	300 375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	Connections	Link	IL (m)	Dia (mm)
CS1	531177.490	190389.777	20.800	1.700	1	Manhole	1 2 0	2.000 1.001 1.002	19.100 19.100 19.100	225 375 225
s4	531178.722	190387.058	20.800	1.863	1200	Manhole	1 0	1.002 1.003	19.087 18.937	225 225
CS2	531188.521	190367.445	20.600	1.673	1	Manhole	1 0	1.003 1.004	18.927 18.927	225 225
s5	531189.518	190365.477	20.600	1.683	1200	Manhole	1 0	1.004 1.005	18.917 18.917	225 225
s6	531192.685	190359.391	20.500	1.653	1200	Manhole	1 0	1.005 1.006	18.847 18.847	225 225
s7	531200.205	190355.048	20.010	1.075	1200	Manhole	0	3.000	18.935	300
CS3	531201.298	190342.333	20.010	1.353	1	Manhole	1 2 0	3.000 1.006 1.007	18.807 18.807 18.657	300 225 300
s8	531202.011	190340.927	20.300	1.648	1200	Manhole	1 0	1.007 1.008	18.652 18.652	300 150
2306	531211.097	190334.788	19.920	1.350	1200	Manhole	1	1.008	18.570	150

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	240	2 year (l/s)	3.1
Winter CV	0.900	Additional Storage (m³/ha)	0.0	30 year (l/s)	3.1
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	100 year (l/s)	3.1
Skip Steady State	x	1 year (l/s)	3.1	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 %)
2	0	0	0
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node 2306 Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.300	255	0.300	510	0.300	765	0.300	1020	0.300	1275	0.300
15	0.300	270	0.300	525	0.300	780	0.300	1035	0.300	1290	0.300
30	0.300	285	0.300	540	0.300	795	0.300	1050	0.300	1305	0.300
45	0.300	300	0.300	555	0.300	810	0.300	1065	0.300	1320	0.300
60	0.300	315	0.300	570	0.300	825	0.300	1080	0.300	1335	0.300
75	0.300	330	0.300	585	0.300	840	0.300	1095	0.300	1350	0.300
90	0.300	345	0.300	600	0.300	855	0.300	1110	0.300	1365	0.300
105	0.300	360	0.300	615	0.300	870	0.300	1125	0.300	1380	0.300
120	0.300	375	0.300	630	0.300	885	0.300	1140	0.300	1395	0.300
135	0.300	390	0.300	645	0.300	900	0.300	1155	0.300	1410	0.300
150	0.300	405	0.300	660	0.300	915	0.300	1170	0.300	1425	0.300
165	0.300	420	0.300	675	0.300	930	0.300	1185	0.300	1440	0.300
180	0.300	435	0.300	690	0.300	945	0.300	1200	0.300		
195	0.300	450	0.300	705	0.300	960	0.300	1215	0.300		
210	0.300	465	0.300	720	0.300	975	0.300	1230	0.300		
225	0.300	480	0.300	735	0.300	990	0.300	1245	0.300		
240	0.300	495	0.300	750	0.300	1005	0.300	1260	0.300		

Node s4 Online Orifice Control

Flap Valve	x	Invert Level (m)	18.937	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.100		

Node s5 Online Orifice Control

Flap Valve	x	Invert Level (m)	18.917	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.020		

Node s8 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	18.652	Product Number	CTL-SHE-0079-3100-1358-3100
Design Depth (m)	1.358	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.1	Min Node Diameter (mm)	1200

Node CS3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.657
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	196.0	0.0	0.800	196.0	0.0	0.801	0.0	0.0

Node CS2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.927
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	295.0	0.0	1.200	295.0	0.0	1.201	0.0	0.0

Node CS1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	19.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	172.5	0.0	1.200	172.5	0.0	1.201	0.0	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

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute winter	75.392	30.400	30 year 360 minute winter	25.280	10.008
2 year 30 minute winter	47.204	19.034	30 year 480 minute winter	19.862	7.901
2 year 60 minute winter	29.162	11.600	30 year 600 minute winter	16.361	6.550
2 year 120 minute winter	21.746	8.650	30 year 720 minute winter	14.060	5.607
2 year 180 minute winter	17.406	6.891	30 year 960 minute winter	11.000	4.373
2 year 240 minute winter	14.443	5.745	30 year 1440 minute winter	7.709	3.074
2 year 360 minute winter	10.933	4.328	100 year +40% CC 15 minute winter	418.696	168.829
2 year 480 minute winter	8.770	3.489	100 year +40% CC 30 minute winter	268.866	108.414
2 year 600 minute winter	7.331	2.935	100 year +40% CC 60 minute winter	166.133	66.083
2 year 720 minute winter	6.372	2.541	100 year +40% CC 120 minute winter	104.806	41.689
2 year 960 minute winter	5.072	2.016	100 year +40% CC 180 minute winter	79.325	31.403
2 year 1440 minute winter	3.646	1.454	100 year +40% CC 240 minute winter	64.051	25.478
30 year 15 minute winter	229.480	92.532	100 year +40% CC 360 minute winter	47.260	18.709
30 year 30 minute winter	146.128	58.922	100 year +40% CC 480 minute winter	37.405	14.879
30 year 60 minute winter	90.104	35.841	100 year +40% CC 600 minute winter	30.945	12.388
30 year 120 minute winter	57.237	22.767	100 year +40% CC 720 minute winter	26.658	10.631
30 year 180 minute winter	43.122	17.071	100 year +40% CC 960 minute winter	20.881	8.301
30 year 240 minute winter	34.616	13.769	100 year +40% CC 1440 minute winter	14.584	5.816

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	s1	80	19.278	0.078	5.6	0.0878	0.0000	OK
15 minute winter	s2	10	19.517	0.142	35.7	0.0401	0.0000	OK
15 minute winter	s3	5	19.329	0.185	42.6	0.2091	0.0000	OK
120 minute winter	CS1	84	19.266	0.166	17.4	27.2270	0.0000	OK
120 minute winter	s4	84	19.265	0.328	10.0	0.3706	0.0000	SURCHARGED
1440 minute winter	CS2	1410	19.246	0.319	3.4	89.4254	0.0000	SURCHARGED
1440 minute winter	s5	1410	19.246	0.329	0.5	0.3722	0.0000	SURCHARGED
1440 minute winter	s6	960	18.933	0.086	2.0	0.0974	0.0000	OK
15 minute winter	s7	10	19.031	0.096	21.8	0.1086	0.0000	OK
1440 minute winter	CS3	960	18.932	0.275	2.6	51.1242	0.0000	OK
1440 minute winter	s8	960	18.932	0.280	1.3	0.3162	0.0000	SURCHARGED
15 minute winter	2306	1	18.870	0.300	0.0	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)
120 minute winter	s1	2.000	CS1	6.2	0.976	0.058	0.0528	
15 minute winter	s2	1.000	s3	35.8	1.132	0.420	0.8361	
15 minute winter	s3	1.001	CS1	42.7	1.802	0.268	0.2002	
120 minute winter	CS1	1.002	s4	8.2	0.554	0.241	0.0971	
120 minute winter	s4	1.003	CS2	9.9	1.193	0.299	0.0922	
1440 minute winter	CS2	1.004	s5	0.5	0.082	0.013	0.0877	
1440 minute winter	s5	1.005	s6	0.5	0.414	0.009	0.0517	
1440 minute winter	s6	1.006	CS3	2.1	0.586	0.021	0.0202	
15 minute winter	s7	3.000	CS3	21.8	1.181	0.196	0.2358	
1440 minute winter	CS3	1.007	s8	1.1	-0.137	0.018	0.1071	
1440 minute winter	s8	1.008	2306	1.3	0.075	0.086	0.1931	46.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	s1	92	19.683	0.483	11.8	0.5466	0.0000	SURCHARGED
15 minute winter	s2	10	19.781	0.406	108.8	0.1149	0.0000	SURCHARGED
120 minute winter	s3	92	19.684	0.540	38.9	0.6102	0.0000	SURCHARGED
120 minute winter	CS1	92	19.683	0.583	44.0	95.5775	0.0000	SURCHARGED
120 minute winter	s4	92	19.679	0.742	15.5	0.8396	0.0000	SURCHARGED
1440 minute winter	CS2	1410	19.560	0.633	4.8	177.2774	0.0000	SURCHARGED
1440 minute winter	s5	1410	19.560	0.643	0.7	0.7267	0.0000	SURCHARGED
480 minute winter	s6	368	19.103	0.256	1.8	0.2901	0.0000	SURCHARGED
15 minute winter	s7	10	19.122	0.187	66.3	0.2112	0.0000	OK
480 minute winter	CS3	368	19.103	0.446	11.2	83.1302	0.0000	SURCHARGED
480 minute winter	s8	368	19.103	0.451	2.8	0.5106	0.0000	SURCHARGED
15 minute winter	2306	1	18.870	0.300	0.3	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)
120 minute winter	s1	2.000	CS1	7.2	1.230	0.068	0.0972	
15 minute winter	s2	1.000	s3	108.8	1.556	1.279	1.7742	
120 minute winter	s3	1.001	CS1	37.3	1.164	0.235	0.7644	
120 minute winter	CS1	1.002	s4	12.8	0.558	0.374	0.1187	
120 minute winter	s4	1.003	CS2	15.4	1.223	0.464	0.0965	
1440 minute winter	CS2	1.004	s5	0.7	-0.081	0.019	0.0877	
1440 minute winter	s5	1.005	s6	0.8	0.410	0.015	0.2147	
480 minute winter	s6	1.006	CS3	3.5	0.686	0.035	0.0441	
15 minute winter	s7	3.000	CS3	66.3	1.547	0.596	0.5468	
480 minute winter	CS3	1.007	s8	2.7	-0.227	0.043	0.1110	
480 minute winter	s8	1.008	2306	2.8	0.157	0.181	0.1931	74.3

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	s1	128	20.796	1.596	10.8	1.8055	0.0000	SURCHARGED
180 minute winter	s2	128	20.800	1.425	45.2	0.4033	1.1240	FLOOD
180 minute winter	s3	128	20.797	1.653	53.5	1.8699	0.0000	SURCHARGED
180 minute winter	CS1	128	20.796	1.696	63.0	196.7319	0.0000	FLOOD RISK
180 minute winter	s4	128	20.787	1.850	25.5	2.0923	0.0000	FLOOD RISK
1440 minute winter	CS2	1440	20.129	1.202	9.2	336.4401	0.0000	SURCHARGED
1440 minute winter	s5	1440	20.129	1.212	1.0	1.3711	0.0000	SURCHARGED
600 minute winter	s6	405	20.011	1.164	2.1	1.3162	0.0000	SURCHARGED
600 minute winter	s7	405	20.010	1.075	10.8	1.2158	7.6074	FLOOD
600 minute winter	CS3	405	20.010	1.353	12.4	149.0531	2.2972	FLOOD
600 minute winter	s8	405	20.010	1.358	3.5	1.5360	0.0000	FLOOD RISK
15 minute winter	2306	1	18.870	0.300	2.6	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)
180 minute winter	s1	2.000	CS1	12.8	1.177	0.121	0.0972	
180 minute winter	s2	1.000	s3	44.8	0.963	0.526	1.8636	
180 minute winter	s3	1.001	CS1	53.1	1.224	0.333	0.7644	
180 minute winter	CS1	1.002	s4	19.2	0.538	0.562	0.1187	
180 minute winter	s4	1.003	CS2	25.0	1.247	0.753	0.0965	
1440 minute winter	CS2	1.004	s5	0.8	-0.082	0.023	0.0877	
1440 minute winter	s5	1.005	s6	0.8	0.418	0.015	0.2729	
600 minute winter	s6	1.006	CS3	2.7	0.660	0.027	0.0441	
600 minute winter	s7	3.000	CS3	10.7	0.759	0.096	0.8987	
600 minute winter	CS3	1.007	s8	2.8	-0.261	0.045	0.1110	
600 minute winter	s8	1.008	2306	2.9	0.163	0.187	0.1931	100.8

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
s1	0.048	4.00	21.800	Manhole	1200	531168.357	190408.063	2.600
s2	0.228	4.00	20.800	Manhole	600	531201.111	190408.665	1.425
s3	0.044	4.00	21.300	Manhole	1200	531177.503	190396.707	2.156
CS1			20.800	Manhole	1	531177.490	190389.777	1.700
s4	0.094	4.00	20.800	Manhole	1200	531178.722	190387.058	1.863
CS2			20.600	Manhole	1	531188.521	190367.445	1.673
s5	0.028	4.00	20.600	Manhole	1200	531189.518	190365.477	1.683
s6	0.012	4.00	20.500	Manhole	1200	531192.685	190359.391	1.653
s7	0.139	4.00	20.010	Manhole	1200	531200.205	190355.048	1.075
CS3			20.010	Manhole	1	531201.298	190342.333	1.353
s8	0.045	4.00	20.300	Manhole	1200	531202.011	190340.927	1.648
2306			19.920	Manhole	1200	531211.097	190334.788	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)
2.000	s1	CS1	2.443	0.600	19.200	19.100	0.100	24.4	225	4.02	50.0
1.000	s2	s3	26.464	0.600	19.375	19.219	0.156	169.6	300	4.37	50.0
1.001	s3	CS1	6.930	0.600	19.144	19.100	0.044	157.5	375	4.45	50.0
1.002	CS1	s4	2.985	0.600	19.100	19.087	0.013	229.6	225	4.50	0.0
1.003	s4	CS2	2.427	0.600	18.937	18.927	0.010	242.7	225	4.55	50.0
1.004	CS2	s5	2.206	0.600	18.927	18.917	0.010	220.6	225	4.59	50.0
1.005	s5	s6	6.861	0.600	18.917	18.847	0.070	98.0	225	4.68	50.0
1.006	s6	CS3	1.109	0.600	18.847	18.807	0.040	27.7	225	4.69	50.0
3.000	s7	CS3	12.762	0.600	18.935	18.807	0.128	99.7	300	4.14	50.0
1.007	CS3	s8	1.576	0.600	18.657	18.652	0.005	315.3	300	4.72	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
2.000	s1	CS1	2.658	105.7	8.2	2.375	1.475	1.475	2.375	0.048	0.0
1.000	s2	s3	1.204	85.1	39.1	1.125	1.781	1.125	1.781	0.228	0.0
1.001	s3	CS1	1.441	159.1	46.7	1.781	1.325	1.325	1.781	0.272	0.0
1.002	CS1	s4	0.858	34.1	0.0	1.475	1.488	1.475	1.488	0.320	0.0
1.003	s4	CS2	0.835	33.2	71.1	1.638	1.448	1.448	1.638	0.414	0.0
1.004	CS2	s5	0.876	34.8	71.1	1.448	1.458	1.448	1.458	0.414	0.0
1.005	s5	s6	1.320	52.5	75.9	1.458	1.428	1.428	1.458	0.442	0.0
1.006	s6	CS3	2.494	99.2	77.9	1.428	0.978	0.978	1.428	0.454	0.0
3.000	s7	CS3	1.574	111.3	23.9	0.775	0.903	0.775	0.903	0.139	0.0
1.007	CS3	s8	0.880	62.2	101.8	1.053	1.348	1.053	1.348	0.593	0.0

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)
1.008	s8	2306	10.966	0.600	18.652	18.570	0.082	133.7	150	4.93	0.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.008	s8	2306	0.867	15.3	0.0	1.498	1.200	1.200	1.498	0.638	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	2.443	24.4	225	21.800	19.200	2.375	20.800	19.100	1.475
1.000	26.464	169.6	300	20.800	19.375	1.125	21.300	19.219	1.781
1.001	6.930	157.5	375	21.300	19.144	1.781	20.800	19.100	1.325
1.002	2.985	229.6	225	20.800	19.100	1.475	20.800	19.087	1.488
1.003	2.427	242.7	225	20.800	18.937	1.638	20.600	18.927	1.448
1.004	2.206	220.6	225	20.600	18.927	1.448	20.600	18.917	1.458
1.005	6.861	98.0	225	20.600	18.917	1.458	20.500	18.847	1.428
1.006	1.109	27.7	225	20.500	18.847	1.428	20.010	18.807	0.978
3.000	12.762	99.7	300	20.010	18.935	0.775	20.010	18.807	0.903
1.007	1.576	315.3	300	20.010	18.657	1.053	20.300	18.652	1.348
1.008	10.966	133.7	150	20.300	18.652	1.498	19.920	18.570	1.200

Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	MH Type
2.000	s1	1200	Manhole	CS1	1	1
1.000	s2	600	Manhole	s3	1200	1
1.001	s3	1200	Manhole	CS1	1	1
1.002	CS1	1	Manhole	s4	1200	1
1.003	s4	1200	Manhole	CS2	1	1
1.004	CS2	1	Manhole	s5	1200	1
1.005	s5	1200	Manhole	s6	1200	1
1.006	s6	1200	Manhole	CS3	1	1
3.000	s7	1200	Manhole	CS3	1	1
1.007	CS3	1	Manhole	s8	1200	1
1.008	s8	1200	Manhole	2306	1200	1

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	Connections	Link	IL (m)	Dia (mm)
s1	531168.357	190408.063	21.800	2.600	1200	Manhole	 0	2.000	19.200	225
s2	531201.111	190408.665	20.800	1.425	600	Manhole	 0	1.000	19.375	300
s3	531177.503	190396.707	21.300	2.156	1200	Manhole	1  0	1.000 1.001	19.219 19.144	300 375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	Connections	Link	IL (m)	Dia (mm)
CS1	531177.490	190389.777	20.800	1.700	1	Manhole	1	2.000	19.100	225
							2	1.001	19.100	375
							0	1.002	19.100	225
s4	531178.722	190387.058	20.800	1.863	1200	Manhole	1	1.002	19.087	225
							0	1.003	18.937	225
CS2	531188.521	190367.445	20.600	1.673	1	Manhole	1	1.003	18.927	225
							0	1.004	18.927	225
s5	531189.518	190365.477	20.600	1.683	1200	Manhole	1	1.004	18.917	225
							0	1.005	18.917	225
s6	531192.685	190359.391	20.500	1.653	1200	Manhole	1	1.005	18.847	225
							0	1.006	18.847	225
s7	531200.205	190355.048	20.010	1.075	1200	Manhole	0	3.000	18.935	300
CS3	531201.298	190342.333	20.010	1.353	1	Manhole	1	3.000	18.807	300
							2	1.006	18.807	225
							0	1.007	18.657	300
s8	531202.011	190340.927	20.300	1.648	1200	Manhole	1	1.007	18.652	300
							0	1.008	18.652	150
2306	531211.097	190334.788	19.920	1.350	1200	Manhole	1	1.008	18.570	150

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	240	2 year (l/s)	3.1
Winter CV	0.900	Additional Storage (m³/ha)	0.0	30 year (l/s)	3.1
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	100 year (l/s)	3.1
Skip Steady State	x	1 year (l/s)	3.1	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 %)
2	0	0	0
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node s4 Online Orifice Control

Flap Valve	x	Invert Level (m)	18.937	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.100		

Node s5 Online Orifice Control

Flap Valve	x	Invert Level (m)	18.917	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.020		

Node s8 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	18.652	Product Number	CTL-SHE-0079-3100-1358-3100
Design Depth (m)	1.358	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.1	Min Node Diameter (mm)	1200

Node CS3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.657
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	196.0	0.0	0.800	196.0	0.0	0.801	0.0	0.0

Node CS2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.927
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	295.0	0.0	1.200	295.0	0.0	1.201	0.0	0.0

Node CS1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	19.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	172.5	0.0	1.200	172.5	0.0	1.201	0.0	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

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute winter	75.392	30.400	30 year 360 minute winter	25.280	10.008
2 year 30 minute winter	47.204	19.034	30 year 480 minute winter	19.862	7.901
2 year 60 minute winter	29.162	11.600	30 year 600 minute winter	16.361	6.550
2 year 120 minute winter	21.746	8.650	30 year 720 minute winter	14.060	5.607
2 year 180 minute winter	17.406	6.891	30 year 960 minute winter	11.000	4.373
2 year 240 minute winter	14.443	5.745	30 year 1440 minute winter	7.709	3.074
2 year 360 minute winter	10.933	4.328	100 year +40% CC 15 minute winter	418.696	168.829
2 year 480 minute winter	8.770	3.489	100 year +40% CC 30 minute winter	268.866	108.414
2 year 600 minute winter	7.331	2.935	100 year +40% CC 60 minute winter	166.133	66.083
2 year 720 minute winter	6.372	2.541	100 year +40% CC 120 minute winter	104.806	41.689
2 year 960 minute winter	5.072	2.016	100 year +40% CC 180 minute winter	79.325	31.403
2 year 1440 minute winter	3.646	1.454	100 year +40% CC 240 minute winter	64.051	25.478
30 year 15 minute winter	229.480	92.532	100 year +40% CC 360 minute winter	47.260	18.709
30 year 30 minute winter	146.128	58.922	100 year +40% CC 480 minute winter	37.405	14.879
30 year 60 minute winter	90.104	35.841	100 year +40% CC 600 minute winter	30.945	12.388
30 year 120 minute winter	57.237	22.767	100 year +40% CC 720 minute winter	26.658	10.631
30 year 180 minute winter	43.122	17.071	100 year +40% CC 960 minute winter	20.881	8.301
30 year 240 minute winter	34.616	13.769	100 year +40% CC 1440 minute winter	14.584	5.816

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	s1	80	19.278	0.078	5.6	0.0878	0.0000	OK
15 minute winter	s2	10	19.517	0.142	35.7	0.0401	0.0000	OK
15 minute winter	s3	5	19.329	0.185	42.7	0.2091	0.0000	OK
120 minute winter	CS1	84	19.266	0.166	17.4	27.2270	0.0000	OK
120 minute winter	s4	84	19.265	0.328	10.0	0.3706	0.0000	SURCHARGED
1440 minute winter	CS2	1410	19.246	0.319	3.4	89.4358	0.0000	SURCHARGED
1440 minute winter	s5	1410	19.246	0.329	0.5	0.3722	0.0000	SURCHARGED
15 minute winter	s6	10	18.874	0.027	2.2	0.0302	0.0000	OK
15 minute winter	s7	10	19.031	0.096	21.8	0.1086	0.0000	OK
360 minute winter	CS3	256	18.806	0.149	4.4	27.8202	0.0000	OK
360 minute winter	s8	256	18.806	0.154	2.4	0.1745	0.0000	SURCHARGED
360 minute winter	2306	256	18.610	0.040	2.4	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)
120 minute winter	s1	2.000	CS1	6.2	0.976	0.058	0.0528	
15 minute winter	s2	1.000	s3	35.8	1.132	0.420	0.8361	
15 minute winter	s3	1.001	CS1	42.7	1.802	0.268	0.2002	
120 minute winter	CS1	1.002	s4	8.2	0.554	0.241	0.0971	
120 minute winter	s4	1.003	CS2	9.9	1.193	0.299	0.0922	
1440 minute winter	CS2	1.004	s5	0.5	0.082	0.013	0.0877	
1440 minute winter	s5	1.005	s6	0.5	0.465	0.009	0.0070	
15 minute winter	s6	1.006	CS3	2.2	0.919	0.022	0.0026	
15 minute winter	s7	3.000	CS3	21.8	1.181	0.196	0.2358	
360 minute winter	CS3	1.007	s8	2.1	-0.163	0.034	0.0564	
360 minute winter	s8	1.008	2306	2.4	0.619	0.154	0.0417	45.9

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	s1	92	19.683	0.483	11.9	0.5466	0.0000	SURCHARGED
15 minute winter	s2	10	19.781	0.406	108.8	0.1149	0.0000	SURCHARGED
120 minute winter	s3	92	19.684	0.540	38.9	0.6102	0.0000	SURCHARGED
120 minute winter	CS1	92	19.683	0.583	44.0	95.5775	0.0000	SURCHARGED
120 minute winter	s4	92	19.679	0.742	15.5	0.8396	0.0000	SURCHARGED
1440 minute winter	CS2	1410	19.556	0.629	4.8	176.1404	0.0000	SURCHARGED
1440 minute winter	s5	1410	19.556	0.639	0.7	0.7221	0.0000	SURCHARGED
240 minute winter	s6	228	19.049	0.202	2.9	0.2284	0.0000	OK
15 minute winter	s7	10	19.122	0.187	66.3	0.2112	0.0000	OK
240 minute winter	CS3	228	19.049	0.392	17.2	72.9861	0.0000	SURCHARGED
240 minute winter	s8	228	19.049	0.397	3.9	0.4489	0.0000	SURCHARGED
240 minute winter	2306	216	18.614	0.044	2.8	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)
120 minute winter	s1	2.000	CS1	7.2	1.230	0.068	0.0972	
15 minute winter	s2	1.000	s3	108.8	1.556	1.279	1.7742	
120 minute winter	s3	1.001	CS1	37.3	1.164	0.235	0.7644	
120 minute winter	CS1	1.002	s4	12.8	0.558	0.375	0.1187	
120 minute winter	s4	1.003	CS2	15.4	1.223	0.464	0.0965	
1440 minute winter	CS2	1.004	s5	0.7	-0.081	0.019	0.0877	
1440 minute winter	s5	1.005	s6	0.7	0.531	0.013	0.0351	
240 minute winter	s6	1.006	CS3	4.4	0.786	0.045	0.0429	
15 minute winter	s7	3.000	CS3	66.3	1.547	0.596	0.5468	
240 minute winter	CS3	1.007	s8	2.8	-0.288	0.046	0.1110	
240 minute winter	s8	1.008	2306	2.8	0.652	0.186	0.0479	67.3

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	s1	128	20.796	1.596	10.8	1.8054	0.0000	SURCHARGED
180 minute winter	s2	128	20.800	1.425	45.2	0.4033	1.1128	FLOOD
180 minute winter	s3	128	20.797	1.653	53.5	1.8699	0.0000	SURCHARGED
180 minute winter	CS1	128	20.796	1.696	63.0	196.7319	0.0000	FLOOD RISK
180 minute winter	s4	128	20.787	1.850	25.6	2.0922	0.0000	FLOOD RISK
1440 minute winter	CS2	1440	20.120	1.193	9.1	334.3495	0.0000	SURCHARGED
1440 minute winter	s5	1440	20.120	1.203	1.0	1.3606	0.0000	SURCHARGED
360 minute winter	s6	320	20.010	1.163	3.7	1.3153	0.0000	SURCHARGED
360 minute winter	s7	320	20.010	1.075	16.4	1.2158	0.7661	FLOOD
360 minute winter	CS3	320	20.010	1.353	19.9	149.0531	0.0000	FLOOD RISK
360 minute winter	s8	320	20.010	1.358	5.3	1.5358	0.0000	FLOOD RISK
360 minute winter	2306	328	18.615	0.045	3.1	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)
180 minute winter	s1	2.000	CS1	13.0	1.177	0.123	0.0972	
180 minute winter	s2	1.000	s3	44.8	0.963	0.526	1.8636	
180 minute winter	s3	1.001	CS1	53.1	1.224	0.333	0.7644	
180 minute winter	CS1	1.002	s4	19.2	0.538	0.562	0.1187	
180 minute winter	s4	1.003	CS2	25.0	1.247	0.754	0.0965	
1440 minute winter	CS2	1.004	s5	0.8	-0.082	0.024	0.0877	
1440 minute winter	s5	1.005	s6	0.8	0.426	0.016	0.2729	
360 minute winter	s6	1.006	CS3	2.7	0.730	0.027	0.0441	
360 minute winter	s7	3.000	CS3	16.1	0.949	0.145	0.8987	
360 minute winter	CS3	1.007	s8	2.5	-0.310	0.041	0.1110	
360 minute winter	s8	1.008	2306	3.1	0.665	0.200	0.0504	79.6

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.720	Minimum Backdrop Height (m)	0.200
Ratio-R	0.450	Preferred Cover Depth (m)	1.200
CV	0.950	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
s1	0.048	4.00	21.800	Manhole	1200	531168.357	190408.063	2.600
s2	0.228	4.00	20.800	Manhole	600	531201.111	190408.665	1.425
s3	0.044	4.00	21.300	Manhole	1200	531177.503	190396.707	2.156
CS1			20.800	Manhole	1	531177.490	190389.777	1.700
s4	0.094	4.00	20.800	Manhole	1200	531178.722	190387.058	1.863
CS2			20.600	Manhole	1	531188.521	190367.445	1.673
s5	0.028	4.00	20.600	Manhole	1200	531189.518	190365.477	1.683
s6	0.012	4.00	20.500	Manhole	1200	531192.685	190359.391	1.653
s7	0.139	4.00	20.010	Manhole	1200	531200.205	190355.048	1.075
CS3			20.010	Manhole	1	531201.298	190342.333	1.353
s8	0.045	4.00	20.300	Manhole	1200	531202.011	190340.927	1.648
2306			19.920	Manhole	1200	531211.097	190334.788	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)
2.000	s1	CS1	2.443	0.600	19.200	19.100	0.100	24.4	225	4.02	50.0
1.000	s2	s3	26.464	0.600	19.375	19.219	0.156	169.6	300	4.37	50.0
1.001	s3	CS1	6.930	0.600	19.144	19.100	0.044	157.5	375	4.45	50.0
1.002	CS1	s4	2.985	0.600	19.100	19.087	0.013	229.6	225	4.50	0.0
1.003	s4	CS2	2.427	0.600	18.937	18.927	0.010	242.7	225	4.55	50.0
1.004	CS2	s5	2.206	0.600	18.927	18.917	0.010	220.6	225	4.59	50.0
1.005	s5	s6	6.861	0.600	18.917	18.847	0.070	98.0	225	4.68	50.0
1.006	s6	CS3	1.109	0.600	18.847	18.807	0.040	27.7	225	4.69	50.0
3.000	s7	CS3	12.762	0.600	18.935	18.807	0.128	99.7	300	4.14	50.0
1.007	CS3	s8	1.576	0.600	18.657	18.652	0.005	315.3	300	4.72	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
2.000	s1	CS1	2.658	105.7	8.2	2.375	1.475	1.475	2.375	0.048	0.0
1.000	s2	s3	1.204	85.1	39.1	1.125	1.781	1.125	1.781	0.228	0.0
1.001	s3	CS1	1.441	159.1	46.7	1.781	1.325	1.325	1.781	0.272	0.0
1.002	CS1	s4	0.858	34.1	0.0	1.475	1.488	1.475	1.488	0.320	0.0
1.003	s4	CS2	0.835	33.2	71.1	1.638	1.448	1.448	1.638	0.414	0.0
1.004	CS2	s5	0.876	34.8	71.1	1.448	1.458	1.448	1.458	0.414	0.0
1.005	s5	s6	1.320	52.5	75.9	1.458	1.428	1.428	1.458	0.442	0.0
1.006	s6	CS3	2.494	99.2	77.9	1.428	0.978	0.978	1.428	0.454	0.0
3.000	s7	CS3	1.574	111.3	23.9	0.775	0.903	0.775	0.903	0.139	0.0
1.007	CS3	s8	0.880	62.2	101.8	1.053	1.348	1.053	1.348	0.593	0.0

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)
1.008	s8	2306	10.966	0.600	18.652	18.570	0.082	133.7	150	4.93	0.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.008	s8	2306	0.867	15.3	0.0	1.498	1.200	1.200	1.498	0.638	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	2.443	24.4	225	21.800	19.200	2.375	20.800	19.100	1.475
1.000	26.464	169.6	300	20.800	19.375	1.125	21.300	19.219	1.781
1.001	6.930	157.5	375	21.300	19.144	1.781	20.800	19.100	1.325
1.002	2.985	229.6	225	20.800	19.100	1.475	20.800	19.087	1.488
1.003	2.427	242.7	225	20.800	18.937	1.638	20.600	18.927	1.448
1.004	2.206	220.6	225	20.600	18.927	1.448	20.600	18.917	1.458
1.005	6.861	98.0	225	20.600	18.917	1.458	20.500	18.847	1.428
1.006	1.109	27.7	225	20.500	18.847	1.428	20.010	18.807	0.978
3.000	12.762	99.7	300	20.010	18.935	0.775	20.010	18.807	0.903
1.007	1.576	315.3	300	20.010	18.657	1.053	20.300	18.652	1.348
1.008	10.966	133.7	150	20.300	18.652	1.498	19.920	18.570	1.200

Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	MH Type
2.000	s1	1200	Manhole	CS1	1	1
1.000	s2	600	Manhole	s3	1200	1
1.001	s3	1200	Manhole	CS1	1	1
1.002	CS1	1	Manhole	s4	1200	1
1.003	s4	1200	Manhole	CS2	1	1
1.004	CS2	1	Manhole	s5	1200	1
1.005	s5	1200	Manhole	s6	1200	1
1.006	s6	1200	Manhole	CS3	1	1
3.000	s7	1200	Manhole	CS3	1	1
1.007	CS3	1	Manhole	s8	1200	1
1.008	s8	1200	Manhole	2306	1200	1

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	Connections	Link	IL (m)	Dia (mm)
s1	531168.357	190408.063	21.800	2.600	1200	Manhole	 0	2.000	19.200	225
s2	531201.111	190408.665	20.800	1.425	600	Manhole	 0	1.000	19.375	300
s3	531177.503	190396.707	21.300	2.156	1200	Manhole	1  0	1.000 1.001	19.219 19.144	300 375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	Connections	Link	IL (m)	Dia (mm)
CS1	531177.490	190389.777	20.800	1.700	1	Manhole		1 2 0	2.000 1.001 1.002	19.100 19.100 19.100	225 375 225
s4	531178.722	190387.058	20.800	1.863	1200	Manhole		1 0	1.002 1.003	19.087 18.937	225 225
CS2	531188.521	190367.445	20.600	1.673	1	Manhole		1 0	1.003 1.004	18.927 18.927	225 225
s5	531189.518	190365.477	20.600	1.683	1200	Manhole		1 0	1.004 1.005	18.917 18.917	225 225
s6	531192.685	190359.391	20.500	1.653	1200	Manhole		1 0	1.005 1.006	18.847 18.847	225 225
s7	531200.205	190355.048	20.010	1.075	1200	Manhole		0	3.000	18.935	300
CS3	531201.298	190342.333	20.010	1.353	1	Manhole		1 2 0	3.000 1.006 1.007	18.807 18.807 18.657	300 225 300
s8	531202.011	190340.927	20.300	1.648	1200	Manhole		1 0	1.007 1.008	18.652 18.652	300 150
2306	531211.097	190334.788	19.920	1.350	1200	Manhole		1	1.008	18.570	150

Simulation Settings

Rainfall Methodology	FSR	Additional Storage (m³/ha)	0.0
FSR Region	England and Wales	Check Discharge Rate(s)	✓
M5-60 (mm)	20.720	1 year (l/s)	3.1
Ratio-R	0.450	2 year (l/s)	3.1
Winter CV	0.900	30 year (l/s)	3.1
Analysis Speed	Detailed	100 year (l/s)	3.1
Skip Steady State	x	Check Discharge Volume	x
Drain Down Time (mins)	240		

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

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node s4 Online Orifice Control

Flap Valve	x	Invert Level (m)	18.937	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.100		

Node s5 Online Orifice Control

Flap Valve	x	Invert Level (m)	18.917	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.020		

Node s8 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	18.652	Product Number	CTL-SHE-0079-3100-1358-3100
Design Depth (m)	1.358	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.1	Min Node Diameter (mm)	1200

Node CS3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.657
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	252

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	196.0	0.0	0.800	196.0	0.0	0.801	0.0	0.0

Node CS2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.927
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	295.0	0.0	1.200	295.0	0.0	1.201	0.0	0.0

Node CS1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	19.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	38

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	172.5	0.0	1.200	172.5	0.0	1.201	0.0	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

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute winter	82.928	33.439	1 year 360 minute winter	9.027	3.574
1 year 30 minute winter	53.273	21.481	1 year 480 minute winter	7.212	2.869
1 year 60 minute winter	33.488	13.320	1 year 600 minute winter	6.042	2.419
1 year 120 minute winter	20.311	8.079	1 year 720 minute winter	5.276	2.104
1 year 180 minute winter	15.150	5.997	1 year 960 minute winter	4.248	1.688
1 year 240 minute winter	12.188	4.848	1 year 1440 minute winter	3.105	1.238

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	s1	45	19.281	0.081	6.6	0.0920	0.0000	OK
15 minute winter	s2	10	19.525	0.150	39.3	0.0425	0.0000	OK
15 minute winter	s3	5	19.338	0.194	47.0	0.2194	0.0000	OK
60 minute winter	CS1	46	19.268	0.168	26.2	27.4612	0.0000	OK
60 minute winter	s4	47	19.266	0.329	10.4	0.3716	0.0000	SURCHARGED
1440 minute winter	CS2	1380	19.202	0.275	3.1	77.1730	0.0000	SURCHARGED
1440 minute winter	s5	1380	19.202	0.285	0.4	0.3228	0.0000	SURCHARGED
15 minute winter	s6	10	18.875	0.028	2.4	0.0317	0.0000	OK
15 minute winter	s7	10	19.036	0.101	24.0	0.1146	0.0000	OK
240 minute winter	CS3	176	18.783	0.126	5.0	23.5179	0.0000	OK
240 minute winter	s8	176	18.783	0.131	2.1	0.1484	0.0000	OK
240 minute winter	2306	176	18.607	0.037	2.1	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)
60 minute winter	s1	2.000	CS1	6.2	1.206	0.059	0.0545	
15 minute winter	s2	1.000	s3	39.4	1.159	0.462	0.8991	
15 minute winter	s3	1.001	CS1	47.0	1.832	0.295	0.2255	
60 minute winter	CS1	1.002	s4	9.1	0.605	0.268	0.0978	
60 minute winter	s4	1.003	CS2	10.3	1.321	0.310	0.0737	
1440 minute winter	CS2	1.004	s5	0.4	0.076	0.012	0.0877	
1440 minute winter	s5	1.005	s6	0.4	0.454	0.008	0.0067	
15 minute winter	s6	1.006	CS3	2.4	0.937	0.024	0.0028	
15 minute winter	s7	3.000	CS3	24.0	1.210	0.216	0.2532	
240 minute winter	CS3	1.007	s8	1.9	-0.167	0.030	0.0455	
240 minute winter	s8	1.008	2306	2.1	0.600	0.137	0.0384	32.1

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
s50	0.027	4.00	20.170	Manhole	600	531253.299	190365.214	1.170
s51	0.022	4.00	20.170	Manhole	600	531238.133	190357.385	1.341
s52	0.072	4.00	19.950	Manhole	600	531240.950	190346.456	0.950
CS4			20.100	Manhole	1	531239.363	190352.518	1.695
s53	0.005	4.00	20.100	Manhole	1200	531240.425	190353.026	1.700
S1			20.200	Manhole	1200	531241.573	190350.839	1.855

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	s50	s51	17.068	0.600	19.000	18.829	0.171	100.0	225	4.22	50.0
1.001	s51	s53	4.925	0.600	18.829	18.405	0.424	11.6	225	4.24	50.0
2.000	s52	CS4	6.266	0.600	19.000	18.937	0.063	100.0	225	4.08	50.0
2.001	CS4	s53	1.177	0.600	18.405	18.400	0.005	235.4	300	4.10	50.0
1.002	s53	S1	2.470	0.600	18.400	18.345	0.055	44.9	150	4.27	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	s50	s51	1.307	52.0	4.6	0.945	1.116	0.945	1.116	0.027	0.0	45	0.814
1.001	s51	s53	3.860	153.5	8.4	1.116	1.470	1.116	1.470	0.049	0.0	36	2.092
2.000	s52	CS4	1.307	52.0	12.4	0.725	0.938	0.725	0.938	0.072	0.0	74	1.074
2.001	CS4	s53	1.020	72.1	12.4	1.395	1.400	1.395	1.400	0.072	0.0	83	0.767
1.002	s53	S1	1.505	26.6	21.6	1.550	1.705	1.550	1.705	0.126	0.0	103	1.673

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	17.068	100.0	225	20.170	19.000	0.945	20.170	18.829	1.116
1.001	4.925	11.6	225	20.170	18.829	1.116	20.100	18.405	1.470
2.000	6.266	100.0	225	19.950	19.000	0.725	20.100	18.937	0.938
2.001	1.177	235.4	300	20.100	18.405	1.395	20.100	18.400	1.400

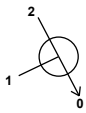
Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	MH Type
1.000	s50	600	Manhole	s51	600	1
1.001	s51	600	Manhole	s53	1200	1
2.000	s52	600	Manhole	CS4	1	1
2.001	CS4	1	Manhole	s53	1200	1

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.002	2.470	44.9	150	20.100	18.400	1.550	20.200	18.345	1.705

Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	MH Type
1.002	s53	1200	Manhole	S1	1200	1

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	Connections	Link	IL (m)	Dia (mm)
s50	531253.299	190365.214	20.170	1.170	600	Manhole				
							0	1.000	19.000	225
s51	531238.133	190357.385	20.170	1.341	600	Manhole	1	1.000	18.829	225
										
							0	1.001	18.829	225
s52	531240.950	190346.456	19.950	0.950	600	Manhole				
							0	2.000	19.000	225
CS4	531239.363	190352.518	20.100	1.695	1	Manhole	1	2.000	18.937	225
										
							0	2.001	18.405	300
s53	531240.425	190353.026	20.100	1.700	1200	Manhole	1	2.001	18.400	300
								2	1.001	18.405	225
							0	1.002	18.400	150
S1	531241.573	190350.839	20.200	1.855	1200	Manhole		1	1.002	18.345	150

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	2 year (l/s)	1.0
Summer CV	0.900	Drain Down Time (mins)	240	30 year (l/s)	1.0
Winter CV	0.900	Additional Storage (m³/ha)	0.0	100 year (l/s)	1.0
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	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 %)
2	0	0	0
30	0	0	0
100	30	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node s53 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	18.400	Product Number	CTL-SHE-0047-1000-1000-1000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node CS4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.405
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	144.0	0.0	0.800	144.0	0.0	0.801	0.0	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

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	107.434	30.400	2 year 720 minute winter	6.372	2.541
2 year 15 minute winter	75.392	30.400	2 year 960 minute summer	7.657	2.016
2 year 30 minute summer	67.266	19.034	2 year 960 minute winter	5.072	2.016
2 year 30 minute winter	47.204	19.034	2 year 1440 minute summer	5.426	1.454
2 year 60 minute summer	43.894	11.600	2 year 1440 minute winter	3.646	1.454
2 year 60 minute winter	29.162	11.600	30 year 15 minute summer	327.009	92.532
2 year 120 minute summer	32.732	8.650	30 year 15 minute winter	229.480	92.532
2 year 120 minute winter	21.746	8.650	30 year 30 minute summer	208.232	58.922
2 year 180 minute summer	26.777	6.891	30 year 30 minute winter	146.128	58.922
2 year 180 minute winter	17.406	6.891	30 year 60 minute summer	135.621	35.841
2 year 240 minute summer	21.740	5.745	30 year 60 minute winter	90.104	35.841
2 year 240 minute winter	14.443	5.745	30 year 120 minute summer	86.152	22.767
2 year 360 minute summer	16.819	4.328	30 year 120 minute winter	57.237	22.767
2 year 360 minute winter	10.933	4.328	30 year 180 minute summer	66.339	17.071
2 year 480 minute summer	13.201	3.489	30 year 180 minute winter	43.122	17.071
2 year 480 minute winter	8.770	3.489	30 year 240 minute summer	52.103	13.769
2 year 600 minute summer	10.730	2.935	30 year 240 minute winter	34.616	13.769
2 year 600 minute winter	7.331	2.935	30 year 360 minute summer	38.891	10.008
2 year 720 minute summer	9.481	2.541	30 year 360 minute winter	25.280	10.008

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 480 minute summer	29.896	7.901
30 year 480 minute winter	19.862	7.901
30 year 600 minute summer	23.946	6.550
30 year 600 minute winter	16.361	6.550
30 year 720 minute summer	20.920	5.607
30 year 720 minute winter	14.060	5.607
30 year 960 minute summer	16.606	4.373
30 year 960 minute winter	11.000	4.373
30 year 1440 minute summer	11.471	3.074
30 year 1440 minute winter	7.709	3.074
100 year +30% CC 15 minute summer	554.024	156.770
100 year +30% CC 15 minute winter	388.789	156.770
100 year +30% CC 30 minute summer	355.768	100.670
100 year +30% CC 30 minute winter	249.662	100.670
100 year +30% CC 60 minute summer	232.197	61.363
100 year +30% CC 60 minute winter	154.266	61.363
100 year +30% CC 120 minute summer	146.482	38.711
100 year +30% CC 120 minute winter	97.319	38.711
100 year +30% CC 180 minute summer	113.317	29.160
100 year +30% CC 180 minute winter	73.659	29.160
100 year +30% CC 240 minute summer	89.521	23.658
100 year +30% CC 240 minute winter	59.476	23.658
100 year +30% CC 360 minute summer	67.511	17.373
100 year +30% CC 360 minute winter	43.884	17.373
100 year +30% CC 480 minute summer	52.280	13.816
100 year +30% CC 480 minute winter	34.734	13.816
100 year +30% CC 600 minute summer	42.055	11.503
100 year +30% CC 600 minute winter	28.734	11.503
100 year +30% CC 720 minute summer	36.833	9.872
100 year +30% CC 720 minute winter	24.754	9.872
100 year +30% CC 960 minute summer	29.271	7.708
100 year +30% CC 960 minute winter	19.390	7.708
100 year +30% CC 1440 minute summer	20.150	5.400
100 year +30% CC 1440 minute winter	13.542	5.400
100 year +40% CC 15 minute summer	596.641	168.829
100 year +40% CC 15 minute winter	418.696	168.829
100 year +40% CC 30 minute summer	383.135	108.414
100 year +40% CC 30 minute winter	268.866	108.414
100 year +40% CC 60 minute summer	250.059	66.083
100 year +40% CC 60 minute winter	166.133	66.083
100 year +40% CC 120 minute summer	157.750	41.689
100 year +40% CC 120 minute winter	104.806	41.689
100 year +40% CC 180 minute summer	122.033	31.403
100 year +40% CC 180 minute winter	79.325	31.403
100 year +40% CC 240 minute summer	96.407	25.478
100 year +40% CC 240 minute winter	64.051	25.478
100 year +40% CC 360 minute summer	72.704	18.709
100 year +40% CC 360 minute winter	47.260	18.709
100 year +40% CC 480 minute summer	56.302	14.879
100 year +40% CC 480 minute winter	37.405	14.879
100 year +40% CC 600 minute summer	45.290	12.388
100 year +40% CC 600 minute winter	30.945	12.388
100 year +40% CC 720 minute summer	39.666	10.631
100 year +40% CC 720 minute winter	26.658	10.631
100 year +40% CC 960 minute summer	31.523	8.301
100 year +40% CC 960 minute winter	20.881	8.301
100 year +40% CC 1440 minute summer	21.700	5.816
100 year +40% CC 1440 minute winter	14.584	5.816

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	s50	10	19.048	0.048	4.7	0.0136	0.0000	OK
15 minute summer	s51	10	18.865	0.036	8.6	0.0102	0.0000	OK
15 minute summer	s52	10	19.083	0.083	12.6	0.0234	0.0000	OK
600 minute summer	CS4	405	18.544	0.139	2.6	20.0278	0.0000	OK
600 minute summer	s53	405	18.544	0.144	1.4	0.1630	0.0000	OK
600 minute summer	S1	405	18.363	0.018	0.8	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 summer	s50	1.000	s51	4.7	0.918	0.090	0.0878	
15 minute summer	s51	1.001	s53	8.6	1.086	0.056	0.0449	
15 minute summer	s52	2.000	CS4	12.6	1.018	0.242	0.0776	
600 minute summer	CS4	2.001	s53	0.7	-0.173	0.010	0.0385	
600 minute summer	s53	1.002	S1	0.8	0.648	0.030	0.0030	26.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	s50	10	19.086	0.086	14.4	0.0244	0.0000	OK
15 minute summer	s51	10	18.893	0.064	26.2	0.0181	0.0000	OK
15 minute summer	s52	10	19.166	0.166	38.5	0.0470	0.0000	OK
360 minute winter	CS4	352	18.786	0.381	7.1	54.8576	0.0000	SURCHARGED
360 minute winter	s53	352	18.786	0.386	3.4	0.4365	0.0000	SURCHARGED
30 minute summer	S1	31	18.363	0.018	0.8	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 summer	s50	1.000	s51	14.4	1.243	0.277	0.1985	
15 minute summer	s51	1.001	s53	26.2	1.552	0.171	0.0875	
15 minute summer	s52	2.000	CS4	38.5	1.327	0.741	0.1814	
360 minute winter	CS4	2.001	s53	-2.5	-0.326	-0.035	0.0829	
360 minute winter	s53	1.002	S1	0.8	0.655	0.031	0.0031	24.0

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	s50	600	19.128	0.128	2.8	0.0361	0.0000	OK
600 minute summer	s51	600	19.128	0.299	5.1	0.0845	0.0000	SURCHARGED
15 minute summer	s52	10	19.318	0.318	65.2	0.0899	0.0000	SURCHARGED
600 minute summer	CS4	600	19.128	0.723	12.5	104.0542	0.0000	SURCHARGED
600 minute summer	s53	600	19.128	0.728	7.1	0.8229	0.0000	SURCHARGED
600 minute summer	S1	600	18.364	0.019	0.9	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)
600 minute summer	s50	1.000	s51	2.8	0.790	0.054	0.5376	
600 minute summer	s51	1.001	s53	6.7	0.485	0.044	0.1959	
15 minute summer	s52	2.000	CS4	65.2	1.640	1.254	0.2437	
600 minute summer	CS4	2.001	s53	-6.3	-0.313	-0.088	0.0829	
600 minute summer	s53	1.002	S1	0.9	0.663	0.032	0.0032	35.7

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	s50	585	19.193	0.193	2.1	0.0546	0.0000	OK
600 minute winter	s51	585	19.193	0.364	3.8	0.1030	0.0000	SURCHARGED
15 minute summer	s52	10	19.349	0.349	70.2	0.0986	0.0000	SURCHARGED
600 minute winter	CS4	585	19.193	0.788	9.0	113.4865	0.0000	SURCHARGED
600 minute winter	s53	585	19.193	0.793	4.2	0.8970	0.0000	SURCHARGED
600 minute winter	S1	585	18.364	0.019	0.9	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)
600 minute winter	s50	1.000	s51	2.1	0.727	0.040	0.6490	
600 minute winter	s51	1.001	s53	3.8	0.467	0.025	0.1959	
15 minute summer	s52	2.000	CS4	70.2	1.765	1.351	0.2453	
600 minute winter	CS4	2.001	s53	-3.4	-0.307	-0.047	0.0829	
600 minute winter	s53	1.002	S1	0.9	0.671	0.034	0.0033	37.1

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
s50	0.027	4.00	20.170	Manhole	600	531253.299	190365.214	1.170
s51	0.022	4.00	20.170	Manhole	600	531238.133	190357.385	1.341
s52	0.072	4.00	19.950	Manhole	600	531240.950	190346.456	0.950
CS4			20.100	Manhole	1	531239.363	190352.518	1.695
s53	0.005	4.00	20.100	Manhole	1200	531240.425	190353.026	1.700
S1			20.200	Manhole	1200	531241.573	190350.839	1.855

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	s50	s51	17.068	0.600	19.000	18.829	0.171	100.0	225	4.22	50.0
1.001	s51	s53	4.925	0.600	18.829	18.405	0.424	11.6	225	4.24	50.0
2.000	s52	CS4	6.266	0.600	19.000	18.937	0.063	100.0	225	4.08	50.0
2.001	CS4	s53	1.177	0.600	18.405	18.400	0.005	235.4	300	4.10	50.0
1.002	s53	S1	2.470	0.600	18.400	18.345	0.055	44.9	150	4.27	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	s50	s51	1.307	52.0	4.6	0.945	1.116	0.945	1.116	0.027	0.0	45	0.814
1.001	s51	s53	3.860	153.5	8.4	1.116	1.470	1.116	1.470	0.049	0.0	36	2.092
2.000	s52	CS4	1.307	52.0	12.4	0.725	0.938	0.725	0.938	0.072	0.0	74	1.074
2.001	CS4	s53	1.020	72.1	12.4	1.395	1.400	1.395	1.400	0.072	0.0	83	0.767
1.002	s53	S1	1.505	26.6	21.6	1.550	1.705	1.550	1.705	0.126	0.0	103	1.673

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	17.068	100.0	225	20.170	19.000	0.945	20.170	18.829	1.116
1.001	4.925	11.6	225	20.170	18.829	1.116	20.100	18.405	1.470
2.000	6.266	100.0	225	19.950	19.000	0.725	20.100	18.937	0.938
2.001	1.177	235.4	300	20.100	18.405	1.395	20.100	18.400	1.400

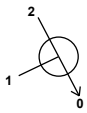
Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	MH Type
1.000	s50	600	Manhole	s51	600	1
1.001	s51	600	Manhole	s53	1200	1
2.000	s52	600	Manhole	CS4	1	1
2.001	CS4	1	Manhole	s53	1200	1

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.002	2.470	44.9	150	20.100	18.400	1.550	20.200	18.345	1.705

Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	MH Type
1.002	s53	1200	Manhole	S1	1200	1

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	Connections	Link	IL (m)	Dia (mm)
s50	531253.299	190365.214	20.170	1.170	600	Manhole				
							0	1.000	19.000	225
s51	531238.133	190357.385	20.170	1.341	600	Manhole				
							1	1.000	18.829	225
							0	1.001	18.829	225
s52	531240.950	190346.456	19.950	0.950	600	Manhole				
							0	2.000	19.000	225
CS4	531239.363	190352.518	20.100	1.695	1	Manhole				
							1	2.000	18.937	225
							0	2.001	18.405	300
s53	531240.425	190353.026	20.100	1.700	1200	Manhole				
							1	2.001	18.400	300
							2	1.001	18.405	225
							0	1.002	18.400	150
S1	531241.573	190350.839	20.200	1.855	1200	Manhole				
							1	1.002	18.345	150

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	2 year (l/s)	1.0
Summer CV	0.900	Drain Down Time (mins)	240	30 year (l/s)	1.0
Winter CV	0.900	Additional Storage (m³/ha)	0.0	100 year (l/s)	1.0
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	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 %)
2	0	0	0
30	0	0	0
100	30	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node S1 Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.300	255	0.300	510	0.300	765	0.300	1020	0.300	1275	0.300
15	0.300	270	0.300	525	0.300	780	0.300	1035	0.300	1290	0.300
30	0.300	285	0.300	540	0.300	795	0.300	1050	0.300	1305	0.300
45	0.300	300	0.300	555	0.300	810	0.300	1065	0.300	1320	0.300
60	0.300	315	0.300	570	0.300	825	0.300	1080	0.300	1335	0.300
75	0.300	330	0.300	585	0.300	840	0.300	1095	0.300	1350	0.300
90	0.300	345	0.300	600	0.300	855	0.300	1110	0.300	1365	0.300
105	0.300	360	0.300	615	0.300	870	0.300	1125	0.300	1380	0.300
120	0.300	375	0.300	630	0.300	885	0.300	1140	0.300	1395	0.300
135	0.300	390	0.300	645	0.300	900	0.300	1155	0.300	1410	0.300
150	0.300	405	0.300	660	0.300	915	0.300	1170	0.300	1425	0.300
165	0.300	420	0.300	675	0.300	930	0.300	1185	0.300	1440	0.300
180	0.300	435	0.300	690	0.300	945	0.300	1200	0.300		
195	0.300	450	0.300	705	0.300	960	0.300	1215	0.300		
210	0.300	465	0.300	720	0.300	975	0.300	1230	0.300		
225	0.300	480	0.300	735	0.300	990	0.300	1245	0.300		
240	0.300	495	0.300	750	0.300	1005	0.300	1260	0.300		

Node s53 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	18.400	Product Number	CTL-SHE-0047-1000-1000-1000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node CS4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.405
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	144.0	0.0	0.800	144.0	0.0	0.801	0.0	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

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	107.434	30.400	30 year 1440 minute winter	7.709	3.074
2 year 15 minute winter	75.392	30.400	100 year +30% CC 15 minute summer	554.024	156.770
2 year 30 minute summer	67.266	19.034	100 year +30% CC 15 minute winter	388.789	156.770
2 year 30 minute winter	47.204	19.034	100 year +30% CC 30 minute summer	355.768	100.670
2 year 60 minute summer	43.894	11.600	100 year +30% CC 30 minute winter	249.662	100.670
2 year 60 minute winter	29.162	11.600	100 year +30% CC 60 minute summer	232.197	61.363
2 year 120 minute summer	32.732	8.650	100 year +30% CC 60 minute winter	154.266	61.363
2 year 120 minute winter	21.746	8.650	100 year +30% CC 120 minute summer	146.482	38.711
2 year 180 minute summer	26.777	6.891	100 year +30% CC 120 minute winter	97.319	38.711
2 year 180 minute winter	17.406	6.891	100 year +30% CC 180 minute summer	113.317	29.160
2 year 240 minute summer	21.740	5.745	100 year +30% CC 180 minute winter	73.659	29.160
2 year 240 minute winter	14.443	5.745	100 year +30% CC 240 minute summer	89.521	23.658
2 year 360 minute summer	16.819	4.328	100 year +30% CC 240 minute winter	59.476	23.658
2 year 360 minute winter	10.933	4.328	100 year +30% CC 360 minute summer	67.511	17.373
2 year 480 minute summer	13.201	3.489	100 year +30% CC 360 minute winter	43.884	17.373
2 year 480 minute winter	8.770	3.489	100 year +30% CC 480 minute summer	52.280	13.816
2 year 600 minute summer	10.730	2.935	100 year +30% CC 480 minute winter	34.734	13.816
2 year 600 minute winter	7.331	2.935	100 year +30% CC 600 minute summer	42.055	11.503
2 year 720 minute summer	9.481	2.541	100 year +30% CC 600 minute winter	28.734	11.503
2 year 720 minute winter	6.372	2.541	100 year +30% CC 720 minute summer	36.833	9.872
2 year 960 minute summer	7.657	2.016	100 year +30% CC 720 minute winter	24.754	9.872
2 year 960 minute winter	5.072	2.016	100 year +30% CC 960 minute summer	29.271	7.708
2 year 1440 minute summer	5.426	1.454	100 year +30% CC 960 minute winter	19.390	7.708
2 year 1440 minute winter	3.646	1.454	100 year +30% CC 1440 minute summer	20.150	5.400
30 year 15 minute summer	327.009	92.532	100 year +30% CC 1440 minute winter	13.542	5.400
30 year 15 minute winter	229.480	92.532	100 year +40% CC 15 minute summer	596.641	168.829
30 year 30 minute summer	208.232	58.922	100 year +40% CC 15 minute winter	418.696	168.829
30 year 30 minute winter	146.128	58.922	100 year +40% CC 30 minute summer	383.135	108.414
30 year 60 minute summer	135.621	35.841	100 year +40% CC 30 minute winter	268.866	108.414
30 year 60 minute winter	90.104	35.841	100 year +40% CC 60 minute summer	250.059	66.083
30 year 120 minute summer	86.152	22.767	100 year +40% CC 60 minute winter	166.133	66.083
30 year 120 minute winter	57.237	22.767	100 year +40% CC 120 minute summer	157.750	41.689
30 year 180 minute summer	66.339	17.071	100 year +40% CC 120 minute winter	104.806	41.689
30 year 180 minute winter	43.122	17.071	100 year +40% CC 180 minute summer	122.033	31.403
30 year 240 minute summer	52.103	13.769	100 year +40% CC 180 minute winter	79.325	31.403
30 year 240 minute winter	34.616	13.769	100 year +40% CC 240 minute summer	96.407	25.478
30 year 360 minute summer	38.891	10.008	100 year +40% CC 240 minute winter	64.051	25.478
30 year 360 minute winter	25.280	10.008	100 year +40% CC 360 minute summer	72.704	18.709
30 year 480 minute summer	29.896	7.901	100 year +40% CC 360 minute winter	47.260	18.709
30 year 480 minute winter	19.862	7.901	100 year +40% CC 480 minute summer	56.302	14.879
30 year 600 minute summer	23.946	6.550	100 year +40% CC 480 minute winter	37.405	14.879
30 year 600 minute winter	16.361	6.550	100 year +40% CC 600 minute summer	45.290	12.388
30 year 720 minute summer	20.920	5.607	100 year +40% CC 600 minute winter	30.945	12.388
30 year 720 minute winter	14.060	5.607	100 year +40% CC 720 minute summer	39.666	10.631
30 year 960 minute summer	16.606	4.373	100 year +40% CC 720 minute winter	26.658	10.631
30 year 960 minute winter	11.000	4.373	100 year +40% CC 960 minute summer	31.523	8.301
30 year 1440 minute summer	11.471	3.074	100 year +40% CC 960 minute winter	20.881	8.301

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 1440 minute summer	21.700	5.816	100 year +40% CC 1440 minute winter	14.584	5.816

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	s50	10	19.048	0.048	4.7	0.0136	0.0000	OK
15 minute summer	s51	10	18.865	0.036	8.6	0.0102	0.0000	OK
15 minute summer	s52	10	19.083	0.083	12.6	0.0234	0.0000	OK
1440 minute summer	CS4	1470	18.654	0.249	1.8	35.9030	0.0000	OK
1440 minute summer	s53	1470	18.654	0.254	0.8	0.2876	0.0000	SURCHARGED
15 minute summer	S1	1	18.645	0.300	0.0	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 summer	s50	1.000	s51	4.7	0.918	0.090	0.0878	
15 minute summer	s51	1.001	s53	8.6	1.044	0.056	0.0465	
15 minute summer	s52	2.000	CS4	12.6	1.018	0.242	0.0776	
1440 minute summer	CS4	2.001	s53	-0.8	-0.064	-0.011	0.0743	
1440 minute summer	s53	1.002	S1	0.0	0.002	0.001	0.0435	0.7

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	s50	10	19.086	0.086	14.4	0.0244	0.0000	OK
15 minute summer	s51	10	18.893	0.064	26.2	0.0181	0.0000	OK
15 minute summer	s52	10	19.166	0.166	38.5	0.0470	0.0000	OK
600 minute winter	CS4	570	18.820	0.415	5.0	59.8252	0.0000	SURCHARGED
600 minute winter	s53	570	18.820	0.420	2.2	0.4755	0.0000	SURCHARGED
15 minute summer	S1	1	18.645	0.300	0.0	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 summer	s50	1.000	s51	14.4	1.243	0.277	0.1984	
15 minute summer	s51	1.001	s53	26.2	1.537	0.171	0.0885	
15 minute summer	s52	2.000	CS4	38.5	1.327	0.741	0.1814	
600 minute winter	CS4	2.001	s53	-2.1	-0.243	-0.029	0.0829	
600 minute winter	s53	1.002	S1	0.8	0.047	0.031	0.0435	24.8

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	s50	705	19.187	0.187	1.7	0.0530	0.0000	OK
720 minute winter	s51	705	19.187	0.358	3.1	0.1014	0.0000	SURCHARGED
15 minute summer	s52	10	19.318	0.318	65.2	0.0899	0.0000	SURCHARGED
720 minute winter	CS4	705	19.187	0.782	7.0	112.6688	0.0000	SURCHARGED
720 minute winter	s53	705	19.187	0.787	3.4	0.8906	0.0000	SURCHARGED
15 minute summer	S1	1	18.645	0.300	0.6	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)
720 minute winter	s50	1.000	s51	1.7	0.682	0.033	0.6411	
720 minute winter	s51	1.001	s53	3.1	0.384	0.020	0.1959	
15 minute summer	s52	2.000	CS4	65.2	1.640	1.254	0.2437	
720 minute winter	CS4	2.001	s53	-2.5	-0.269	-0.035	0.0829	
720 minute winter	s53	1.002	S1	0.8	0.047	0.031	0.0435	29.4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	s50	555	19.951	0.951	2.1	0.2692	0.0000	FLOOD RISK
600 minute winter	s51	555	19.951	1.122	3.8	0.3175	0.0000	FLOOD RISK
720 minute winter	s52	645	19.950	0.950	4.8	0.2689	1.2178	FLOOD
600 minute winter	CS4	555	19.951	1.546	8.9	115.2720	0.0000	FLOOD RISK
600 minute winter	s53	555	19.951	1.551	4.2	1.7538	0.0000	FLOOD RISK
15 minute summer	S1	1	18.645	0.300	0.7	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)
600 minute winter	s50	1.000	s51	2.1	0.727	0.040	0.6788	
600 minute winter	s51	1.001	s53	3.8	0.459	0.025	0.1959	
720 minute winter	s52	2.000	CS4	4.8	0.791	0.092	0.2492	
600 minute winter	CS4	2.001	s53	-3.3	-0.357	-0.046	0.0829	
600 minute winter	s53	1.002	S1	1.1	0.064	0.042	0.0435	29.6

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.720	Minimum Backdrop Height (m)	0.200
Ratio-R	0.450	Preferred Cover Depth (m)	1.200
CV	0.950	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
s50	0.027	4.00	20.170	Manhole	600	531253.299	190365.214	1.170
s51	0.022	4.00	20.170	Manhole	600	531238.133	190357.385	1.341
s52	0.072	4.00	19.950	Manhole	600	531240.950	190346.456	0.950
CS4			20.100	Manhole	1	531239.363	190352.518	1.695
s53	0.005	4.00	20.100	Manhole	1200	531240.425	190353.026	1.700
S1			20.200	Manhole	1200	531241.573	190350.839	1.855

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	s50	s51	17.068	0.600	19.000	18.829	0.171	100.0	225	4.22	50.0
1.001	s51	s53	4.925	0.600	18.829	18.405	0.424	11.6	225	4.24	50.0
2.000	s52	CS4	6.266	0.600	19.000	18.937	0.063	100.0	225	4.08	50.0
2.001	CS4	s53	1.177	0.600	18.405	18.400	0.005	235.4	300	4.10	50.0
1.002	s53	S1	2.470	0.600	18.400	18.345	0.055	44.9	150	4.27	50.0

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	s50	s51	1.307	52.0	4.6	0.945	1.116	0.945	1.116	0.027	0.0	45	0.814
1.001	s51	s53	3.860	153.5	8.4	1.116	1.470	1.116	1.470	0.049	0.0	36	2.092
2.000	s52	CS4	1.307	52.0	12.4	0.725	0.938	0.725	0.938	0.072	0.0	74	1.074
2.001	CS4	s53	1.020	72.1	12.4	1.395	1.400	1.395	1.400	0.072	0.0	83	0.767
1.002	s53	S1	1.505	26.6	21.6	1.550	1.705	1.550	1.705	0.126	0.0	103	1.673

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	17.068	100.0	225	20.170	19.000	0.945	20.170	18.829	1.116
1.001	4.925	11.6	225	20.170	18.829	1.116	20.100	18.405	1.470
2.000	6.266	100.0	225	19.950	19.000	0.725	20.100	18.937	0.938
2.001	1.177	235.4	300	20.100	18.405	1.395	20.100	18.400	1.400

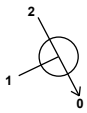
Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	MH Type
1.000	s50	600	Manhole	s51	600	1
1.001	s51	600	Manhole	s53	1200	1
2.000	s52	600	Manhole	CS4	1	1
2.001	CS4	1	Manhole	s53	1200	1

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.002	2.470	44.9	150	20.100	18.400	1.550	20.200	18.345	1.705

Link	US Node	Dia (mm)	Node Type	DS Node	Dia (mm)	MH Type
1.002	s53	1200	Manhole	S1	1200	1

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	Connections	Link	IL (m)	Dia (mm)
s50	531253.299	190365.214	20.170	1.170	600	Manhole				
							0	1.000	19.000	225
s51	531238.133	190357.385	20.170	1.341	600	Manhole		1	1.000	18.829	225
										
							0	1.001	18.829	225
s52	531240.950	190346.456	19.950	0.950	600	Manhole				
							0	2.000	19.000	225
CS4	531239.363	190352.518	20.100	1.695	1	Manhole		1	2.000	18.937	225
										
							0	2.001	18.405	300
s53	531240.425	190353.026	20.100	1.700	1200	Manhole		1	2.001	18.400	300
								2	1.001	18.405	225
							0	1.002	18.400	150
S1	531241.573	190350.839	20.200	1.855	1200	Manhole		1	1.002	18.345	150

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.720	Additional Storage (m³/ha)	0.0
Ratio-R	0.450	Check Discharge Rate(s)	✓
Summer CV	0.900	1 year (l/s)	1.0
Winter CV	0.900	Check Discharge Volume	x
Analysis Speed	Detailed		

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

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node s53 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	18.400	Product Number	CTL-SHE-0047-1000-1000-1000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node CS4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.405
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	312

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	144.0	0.0	0.800	144.0	0.0	0.801	0.0	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

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	118.172	33.439	1 year 360 minute summer	13.887	3.574
1 year 15 minute winter	82.928	33.439	1 year 360 minute winter	9.027	3.574
1 year 30 minute summer	75.914	21.481	1 year 480 minute summer	10.855	2.869
1 year 30 minute winter	53.273	21.481	1 year 480 minute winter	7.212	2.869
1 year 60 minute summer	50.405	13.320	1 year 600 minute summer	8.843	2.419
1 year 60 minute winter	33.488	13.320	1 year 600 minute winter	6.042	2.419
1 year 120 minute summer	30.572	8.079	1 year 720 minute summer	7.851	2.104
1 year 120 minute winter	20.311	8.079	1 year 720 minute winter	5.276	2.104
1 year 180 minute summer	23.306	5.997	1 year 960 minute summer	6.412	1.688
1 year 180 minute winter	15.150	5.997	1 year 960 minute winter	4.248	1.688
1 year 240 minute summer	18.345	4.848	1 year 1440 minute summer	4.621	1.238
1 year 240 minute winter	12.188	4.848	1 year 1440 minute winter	3.105	1.238

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 summer	s50	10	19.051	0.051	5.2	0.0143	0.0000	OK
15 minute summer	s51	10	18.867	0.038	9.4	0.0107	0.0000	OK
15 minute summer	s52	10	19.087	0.087	13.9	0.0248	0.0000	OK
480 minute summer	CS4	320	18.517	0.112	2.8	16.0689	0.0000	OK
480 minute summer	s53	320	18.517	0.117	1.4	0.1319	0.0000	OK
480 minute summer	S1	328	18.362	0.017	0.8	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 summer	s50	1.000	s51	5.2	0.948	0.100	0.0942	
15 minute summer	s51	1.001	s53	9.4	1.121	0.061	0.0467	
15 minute summer	s52	2.000	CS4	13.9	1.044	0.267	0.0834	
480 minute summer	CS4	2.001	s53	-0.8	-0.176	-0.011	0.0289	
480 minute summer	s53	1.002	S1	0.8	0.639	0.028	0.0029	20.5