

	Robert E Fry & Associates 45 Bridgeman Terrace Wigan WN1 1TT	File: FL1.PFD Network: Storm Network 1 Paul Thompson 29.09.23	Page 1 Brownhill Learning Community Sutherland Road Heywood				
Design Settings							
Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00				
Return Period (years)	2	Maximum Rainfall (mm/hr)	200.0				
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)	0.200				
Ratio-R	0.400	Preferred Cover Depth (m)	1.200				
CV	1.000	Include Intermediate Ground	✓				
Time of Entry (mins)	5.00	Enforce best practice design rules	x				
D AND CG Manhole Type							
Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)		
299	1200	899	1800	1801	3000		
449	1350	1199	2100				
599	1500	1799	2700				
>1801 Link+900 mm							
SW CIRCULAR Link Type							
	Shape	Circular	Auto Increment (mm)	75			
	Barrels	1	Follow Ground	x			
Available Diameters (mm)							
225	375	525	750	900	1200	1500	
300	450	600	825	1050	1350	1800	
Nodes							
Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
101	0.037	5.00	125.623	1200	383884.929	410053.519	1.500
102	0.140	5.00	123.186	1350	383914.872	410022.149	1.387
103			123.000	1350	383916.894	409997.610	1.379
104	0.084	5.00	123.000	1350	383913.592	409994.235	1.400
105	0.034	5.00	123.080	1350	383883.810	409992.111	1.883
106	0.091	5.00	123.240	1350	383832.531	409999.986	1.403
107			123.030	1350	383837.984	409971.479	1.400
108	0.110	5.00	123.180	1350	383854.759	409973.048	1.668
CELL			123.180	1200	383874.689	409982.730	2.380
HB			122.800	2100	383888.832	409984.780	2.086
111			120.580	1200	383919.636	409969.209	1.316
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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	101	102	43.367	0.600	124.123	122.300	1.823	23.8	300	5.22	69.0
1.001	102	103	24.622	0.600	121.799	121.621	0.178	138.3	300	5.53	67.3
1.002	103	104	4.722	0.600	121.621	121.600	0.021	224.8	300	5.61	66.9
1.003	104	105	29.858	0.600	121.600	121.197	0.403	74.1	300	5.88	65.5
1.004	105	CELL	13.084	0.600	121.197	120.800	0.397	33.0	300	5.96	65.1
2.000	106	107	29.024	0.600	121.837	121.630	0.207	140.2	300	5.36	68.2
2.001	107	108	16.848	0.600	121.630	121.512	0.118	143.0	300	5.58	67.0
2.002	108	CELL	22.157	0.600	121.512	120.800	0.712	31.1	300	5.71	66.3
1.005	CELL	HB	14.291	0.600	120.800	120.714	0.086	167.0	225	6.19	63.9
1.006	HB	111	34.516	0.600	120.714	119.264	1.450	23.8	225	6.41	62.9

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	3.236	228.8	9.2	1.200	0.586	0.037	0.0	41	1.606
1.001	1.335	94.3	43.0	1.087	1.079	0.177	0.0	142	1.305
1.002	1.044	73.8	42.8	1.079	1.100	0.177	0.0	164	1.081
1.003	1.828	129.2	61.7	1.100	1.583	0.261	0.0	146	1.809
1.004	2.748	194.2	69.4	1.583	2.080	0.295	0.0	123	2.522
2.000	1.326	93.7	22.4	1.103	1.100	0.091	0.0	99	1.093
2.001	1.312	92.8	22.0	1.100	1.368	0.091	0.0	99	1.082
2.002	2.828	199.9	48.2	1.368	2.080	0.201	0.0	100	2.341
1.005	1.009	40.1	114.6	2.155	1.861	0.496	0.0	225	1.027
1.006	2.693	107.1	112.8	1.861	1.091	0.496	0.0	199	3.027

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	43.367	23.8	300	SW CIRCULAR	125.623	124.123	1.200	123.186	122.300	0.586
1.001	24.622	138.3	300	SW CIRCULAR	123.186	121.799	1.087	123.000	121.621	1.079
1.002	4.722	224.8	300	SW CIRCULAR	123.000	121.621	1.079	123.000	121.600	1.100
1.003	29.858	74.1	300	SW CIRCULAR	123.000	121.600	1.100	123.080	121.197	1.583
1.004	13.084	33.0	300	SW CIRCULAR	123.080	121.197	1.583	123.180	120.800	2.080
2.000	29.024	140.2	300	SW CIRCULAR	123.240	121.837	1.103	123.030	121.630	1.100
2.001	16.848	143.0	300	SW CIRCULAR	123.030	121.630	1.100	123.180	121.512	1.368

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	101	1200	Manhole	D AND CG	102	1350	Manhole	D AND CG
1.001	102	1350	Manhole	D AND CG	103	1350	Manhole	D AND CG
1.002	103	1350	Manhole	D AND CG	104	1350	Manhole	D AND CG
1.003	104	1350	Manhole	D AND CG	105	1350	Manhole	D AND CG
1.004	105	1350	Manhole	D AND CG	CELL	1200	Manhole	D AND CG
2.000	106	1350	Manhole	D AND CG	107	1350	Manhole	D AND CG
2.001	107	1350	Manhole	D AND CG	108	1350	Manhole	D AND CG

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.002	22.157	31.1	300	SW CIRCULAR	123.180	121.512	1.368	123.180	120.800	2.080
1.005	14.291	167.0	225	SW CIRCULAR	123.180	120.800	2.155	122.800	120.714	1.861
1.006	34.516	23.8	225	SW CIRCULAR	122.800	120.714	1.861	120.580	119.264	1.091

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.002	108	1350	Manhole	D AND CG	CELL	1200	Manhole	D AND CG
1.005	CELL	1200	Manhole	D AND CG	HB	2100	Manhole	D AND CG
1.006	HB	2100	Manhole	D AND CG	111	1200	Manhole	D AND CG

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.400	Check Discharge Rate(s)	✓
Summer CV	1.000	30 year (l/s)	15.0
Winter CV	1.000	100 year (l/s)	15.0
Analysis Speed	Detailed	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	40	0	0
100	45	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 111 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	1.150	250	1.225	500	1.225	750	1.225	1000	1.225	1250	1.225
10	0.000	260	1.225	510	1.225	760	1.225	1010	1.225	1260	1.225
20	0.000	270	1.225	520	1.225	770	1.225	1020	1.225	1270	1.225
30	1.225	280	1.225	530	1.225	780	1.225	1030	1.225	1280	1.225
40	1.225	290	1.225	540	1.225	790	1.225	1040	1.225	1290	1.225
50	1.225	300	1.225	550	1.225	800	1.225	1050	1.225	1300	1.225
60	1.225	310	1.225	560	1.225	810	1.225	1060	1.225	1310	1.225
70	1.225	320	1.225	570	1.225	820	1.225	1070	1.225	1320	1.225
80	1.225	330	1.225	580	1.225	830	1.225	1080	1.225	1330	1.225
90	1.225	340	1.225	590	1.225	840	1.225	1090	1.225	1340	1.225
100	1.225	350	1.225	600	1.225	850	1.225	1100	1.225	1350	1.225
110	1.225	360	1.225	610	1.225	860	1.225	1110	1.225	1360	1.225
120	1.225	370	1.225	620	1.225	870	1.225	1120	1.225	1370	1.225
130	1.225	380	1.225	630	1.225	880	1.225	1130	1.225	1380	1.225
140	1.225	390	1.225	640	1.225	890	1.225	1140	1.225	1390	1.225
150	1.225	400	1.225	650	1.225	900	1.225	1150	1.225	1400	1.225
160	1.225	410	1.225	660	1.225	910	1.225	1160	1.225	1410	1.225
170	1.225	420	1.225	670	1.225	920	1.225	1170	1.225	1420	1.225
180	1.225	430	1.225	680	1.225	930	1.225	1180	1.225	1430	1.225
190	1.225	440	1.225	690	1.225	940	1.225	1190	1.225	1440	1.225
200	1.225	450	1.225	700	1.225	950	1.225	1200	1.225		
210	1.225	460	1.225	710	1.225	960	1.225	1210	1.225		
220	1.225	470	1.225	720	1.225	970	1.225	1220	1.225		
230	1.225	480	1.225	730	1.225	980	1.225	1230	1.225		
240	1.225	490	1.225	740	1.225	990	1.225	1240	1.225		

Node HB Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	120.714	Product Number	CTL-SHE-0172-1500-1200-1500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	15.0	Min Node Diameter (mm)	1500

Node CELL Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	120.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	156

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	240.0	0.0	1.200	240.0	0.0	1.201	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	1 year 120 minute winter	19.966	7.942
1 year 15 minute winter	76.857	30.991	1 year 180 minute summer	23.233	5.979
1 year 30 minute summer	71.439	20.215	1 year 180 minute winter	15.102	5.979
1 year 30 minute winter	50.133	20.215	1 year 240 minute summer	18.475	4.882
1 year 60 minute summer	48.435	12.800	1 year 240 minute winter	12.274	4.882
1 year 60 minute winter	32.179	12.800	1 year 360 minute summer	14.169	3.646
1 year 120 minute summer	30.053	7.942	1 year 360 minute winter	9.210	3.646

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 480 minute summer	11.185	2.956	30 year +40% CC 720 minute winter	16.456	6.562
1 year 480 minute winter	7.431	2.956	30 year +40% CC 960 minute summer	19.901	5.240
1 year 600 minute summer	9.182	2.511	30 year +40% CC 960 minute winter	13.183	5.240
1 year 600 minute winter	6.274	2.511	30 year +40% CC 1440 minute summer	14.225	3.812
1 year 720 minute summer	8.203	2.199	30 year +40% CC 1440 minute winter	9.560	3.812
1 year 720 minute winter	5.513	2.199	100 year +45% CC 15 minute summer	505.670	143.087
1 year 960 minute summer	6.768	1.782	100 year +45% CC 15 minute winter	354.856	143.087
1 year 960 minute winter	4.483	1.782	100 year +45% CC 30 minute summer	332.000	93.944
1 year 1440 minute summer	4.949	1.326	100 year +45% CC 30 minute winter	232.982	93.944
1 year 1440 minute winter	3.326	1.326	100 year +45% CC 60 minute summer	222.268	58.739
30 year +40% CC 15 minute summer	376.189	106.449	100 year +45% CC 60 minute winter	147.669	58.739
30 year +40% CC 15 minute winter	263.992	106.449	100 year +45% CC 120 minute summer	134.215	35.469
30 year +40% CC 30 minute summer	244.900	69.298	100 year +45% CC 120 minute winter	89.169	35.469
30 year +40% CC 30 minute winter	171.860	69.298	100 year +45% CC 180 minute summer	101.219	26.047
30 year +40% CC 60 minute summer	163.225	43.136	100 year +45% CC 180 minute winter	65.795	26.047
30 year +40% CC 60 minute winter	108.443	43.136	100 year +45% CC 240 minute summer	78.690	20.795
30 year +40% CC 120 minute summer	98.613	26.061	100 year +45% CC 240 minute winter	52.280	20.795
30 year +40% CC 120 minute winter	65.516	26.061	100 year +45% CC 360 minute summer	58.701	15.106
30 year +40% CC 180 minute summer	74.617	19.202	100 year +45% CC 360 minute winter	38.157	15.106
30 year +40% CC 180 minute winter	48.503	19.202	100 year +45% CC 480 minute summer	45.550	12.038
30 year +40% CC 240 minute summer	58.245	15.393	100 year +45% CC 480 minute winter	30.262	12.038
30 year +40% CC 240 minute winter	38.697	15.393	100 year +45% CC 600 minute summer	36.875	10.086
30 year +40% CC 360 minute summer	43.710	11.248	100 year +45% CC 600 minute winter	25.195	10.086
30 year +40% CC 360 minute winter	28.413	11.248	100 year +45% CC 720 minute summer	32.556	8.725
30 year +40% CC 480 minute summer	34.053	8.999	100 year +45% CC 720 minute winter	21.879	8.725
30 year +40% CC 480 minute winter	22.624	8.999	100 year +45% CC 960 minute summer	26.340	6.936
30 year +40% CC 600 minute summer	27.658	7.565	100 year +45% CC 960 minute winter	17.448	6.936
30 year +40% CC 600 minute winter	18.898	7.565	100 year +45% CC 1440 minute summer	18.700	5.012
30 year +40% CC 720 minute summer	24.485	6.562	100 year +45% CC 1440 minute winter	12.567	5.012

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.60%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	101	10	124.158	0.035	6.6	0.0566	0.0000	OK
15 minute summer	102	10	121.924	0.125	31.4	0.4311	0.0000	OK
15 minute summer	103	11	121.769	0.148	31.1	0.2112	0.0000	OK
15 minute summer	104	11	121.728	0.128	45.5	0.3375	0.0000	OK
15 minute summer	105	10	121.323	0.126	51.4	0.2260	0.0000	OK
15 minute summer	106	10	121.923	0.086	16.3	0.2347	0.0000	OK
15 minute summer	107	11	121.718	0.088	16.1	0.1259	0.0000	OK
15 minute summer	108	10	121.607	0.095	35.4	0.2624	0.0000	OK
60 minute summer	CELL	44	120.965	0.165	59.7	37.6936	0.0000	OK
60 minute summer	HB	44	120.954	0.240	15.1	0.8327	0.0000	SURCHARGED
15 minute summer	111	31	120.489	1.225	14.2	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	101	1.000	102	6.4	1.429	0.028	0.1955	
15 minute summer	102	1.001	103	31.1	1.002	0.329	0.7635	
15 minute summer	103	1.002	104	31.0	0.981	0.420	0.1493	
15 minute summer	104	1.003	105	45.6	1.651	0.353	0.8436	
15 minute summer	105	1.004	CELL	52.3	2.814	0.269	0.2857	
15 minute summer	106	2.000	107	16.1	0.951	0.172	0.4906	
15 minute summer	107	2.001	108	16.1	0.946	0.173	0.3067	
15 minute summer	108	2.002	CELL	35.7	2.666	0.179	0.3976	
60 minute summer	CELL	1.005	HB	15.1	0.609	0.376	0.5065	
60 minute summer	HB	Hydro-Brake®	111	14.6				61.2

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.60%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	101	10	124.187	0.064	22.7	0.1043	0.0000	OK
15 minute summer	102	11	122.434	0.635	108.7	2.1914	0.0000	SURCHARGED
15 minute summer	103	11	122.179	0.558	99.2	0.7989	0.0000	SURCHARGED
15 minute summer	104	11	122.091	0.491	147.6	1.2914	0.0000	SURCHARGED
120 minute winter	105	116	121.556	0.359	53.1	0.6432	0.0000	SURCHARGED
15 minute summer	106	10	122.014	0.177	55.9	0.4837	0.0000	OK
15 minute summer	107	10	121.815	0.185	55.3	0.2642	0.0000	OK
15 minute summer	108	10	121.695	0.183	122.4	0.5019	0.0000	OK
120 minute winter	CELL	118	121.555	0.755	89.3	172.9418	0.0000	SURCHARGED
120 minute winter	HB	118	121.544	0.829	16.0	2.8733	0.0000	SURCHARGED
15 minute summer	111	31	120.489	1.225	15.0	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	101	1.000	102	22.7	2.002	0.099	0.8897	
15 minute summer	102	1.001	103	99.2	1.408	1.051	1.7339	
15 minute summer	103	1.002	104	98.4	1.398	1.334	0.3325	
15 minute summer	104	1.003	105	146.2	2.077	1.131	2.1026	
120 minute winter	105	1.004	CELL	53.1	1.975	0.273	0.9214	
15 minute summer	106	2.000	107	55.3	1.245	0.590	1.2888	
15 minute summer	107	2.001	108	55.0	1.274	0.593	0.7611	
15 minute summer	108	2.002	CELL	122.4	2.945	0.612	1.2311	
120 minute winter	CELL	1.005	HB	16.0	0.568	0.399	0.5684	
120 minute winter	HB	Hydro-Brake®	111	15.0				251.5

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.60%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	101	10	124.196	0.073	30.6	0.1191	0.0000	OK
15 minute summer	102	12	123.186	1.387	146.0	4.7851	0.0000	FLOOD RISK
15 minute summer	103	12	122.840	1.219	115.6	1.7445	0.0000	FLOOD RISK
15 minute summer	104	12	122.718	1.118	177.0	2.9403	0.0000	FLOOD RISK
120 minute winter	105	118	121.887	0.690	73.0	1.2367	0.0000	SURCHARGED
15 minute summer	106	10	122.058	0.221	75.2	0.6026	0.0000	OK
120 minute winter	107	118	121.886	0.256	22.3	0.3665	0.0000	OK
120 minute winter	108	118	121.886	0.374	49.3	1.0288	0.0000	SURCHARGED
120 minute winter	CELL	118	121.886	1.086	118.3	248.7371	0.0000	SURCHARGED
120 minute winter	HB	118	121.870	1.156	16.2	4.0045	0.0000	SURCHARGED
15 minute summer	111	31	120.489	1.225	15.0	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	101	1.000	102	30.4	2.010	0.133	1.8157	
15 minute summer	102	1.001	103	115.6	1.642	1.226	1.7339	
15 minute summer	103	1.002	104	115.7	1.644	1.568	0.3325	
15 minute summer	104	1.003	105	170.5	2.421	1.319	2.1026	
120 minute winter	105	1.004	CELL	69.7	2.093	0.359	0.9214	
15 minute summer	106	2.000	107	74.3	1.299	0.793	1.6591	
120 minute winter	107	2.001	108	22.3	1.042	0.240	1.1328	
120 minute winter	108	2.002	CELL	49.3	1.972	0.247	1.5603	
120 minute winter	CELL	1.005	HB	16.2	0.566	0.404	0.5684	
120 minute winter	HB	Hydro-Brake®	111	15.0				284.4