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)	20.000	Minimum Backdrop Height (m)	4.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	3.00	Enforce best practice design rules	✓

Circular_Default Sewer Type Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
14	0.021	3.00	62.100	1200	508982.098	154304.597	1.374
15	0.047	3.00	61.802	1200	508996.478	154315.994	1.520
16	0.077	3.00	61.439	1200	509011.256	154331.872	1.512
17			61.593	1200	508994.705	154347.765	1.760
20	0.025	3.00	61.150	1200	508999.203	154372.960	1.425
18	0.049	3.00	61.462	1200	508986.596	154366.339	1.896
19	0.056	3.00	61.278	1200	508981.274	154383.422	1.861
8	0.073	3.00	61.055	1350	508972.213	154401.370	1.914
9			60.652	1350	509008.977	154420.639	1.639
10	0.058	3.00	60.456	1350	509026.192	154429.667	1.637
11	0.090		60.200	1350	509049.317	154430.228	1.800
12		3.00	60.200	1200	509060.226	154426.626	1.800
13			59.500	1200	509072.315	154430.896	1.400

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	14	15	18.349	0.600	60.726	60.432	0.294	62.4	150	3.24	50.0
2.001	15	16	21.691	0.600	60.282	59.927	0.355	61.1	300	3.42	50.0
2.002	16	17	22.946	0.600	59.927	59.833	0.094	244.1	300	3.80	50.0
2.003	17	18	20.267	0.600	59.833	59.566	0.267	75.9	300	3.99	50.0
3.000	20	18	14.240	0.600	59.725	59.641	0.084	169.5	225	3.24	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
2.000	1.275	22.5	2.8	1.224	1.220	0.021	0.0
2.001	2.015	142.4	9.2	1.220	1.212	0.068	0.0
2.002	1.002	70.8	19.7	1.212	1.460	0.145	0.0
2.003	1.806	127.7	19.7	1.460	1.596	0.145	0.0
3.000	1.001	39.8	3.4	1.200	1.596	0.025	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)
2.004	18	19	17.893	0.600	59.566	59.492	0.074	241.8	300	4.28	50.0
2.005	19	8	20.106	0.600	59.417	59.141	0.276	72.8	375	4.44	50.0
1.003	8	9	41.508	0.600	59.141	59.013	0.128	324.3	375	5.13	50.0
1.004	9	10	19.439	0.600	59.013	58.819	0.194	100.0	375	5.31	50.0
1.005	10	11	23.132	0.600	58.819	58.400	0.419	55.2	375	5.47	50.0
1.007	12	13	12.821	0.600	58.400	58.100	0.300	42.7	150	3.14	50.0

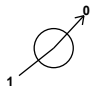
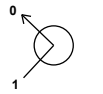
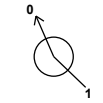
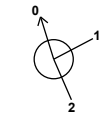
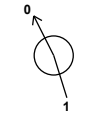
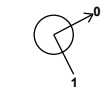
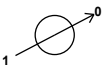
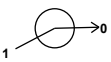
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
2.004	1.006	71.1	29.7	1.596	1.486	0.219	0.0
2.005	2.125	234.7	37.3	1.486	1.539	0.275	0.0
1.003	1.000	110.5	47.2	1.539	1.264	0.348	0.0
1.004	1.812	200.1	47.2	1.264	1.262	0.348	0.0
1.005	2.443	269.8	55.0	1.262	1.425	0.406	0.0
1.007	1.543	27.3	0.0	1.650	1.250	0.000	0.0

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)
2.000	18.349	62.4	150	Circular_Default Sewer Type	62.100	60.726	1.224	61.802	60.432	1.220
2.001	21.691	61.1	300	Circular_Default Sewer Type	61.802	60.282	1.220	61.439	59.927	1.212
2.002	22.946	244.1	300	Circular_Default Sewer Type	61.439	59.927	1.212	61.593	59.833	1.460
2.003	20.267	75.9	300	Circular_Default Sewer Type	61.593	59.833	1.460	61.462	59.566	1.596
3.000	14.240	169.5	225	Circular_Default Sewer Type	61.150	59.725	1.200	61.462	59.641	1.596
2.004	17.893	241.8	300	Circular_Default Sewer Type	61.462	59.566	1.596	61.278	59.492	1.486
2.005	20.106	72.8	375	Circular_Default Sewer Type	61.278	59.417	1.486	61.055	59.141	1.539
1.003	41.508	324.3	375	Circular_Default Sewer Type	61.055	59.141	1.539	60.652	59.013	1.264
1.004	19.439	100.0	375	Circular_Default Sewer Type	60.652	59.013	1.264	60.456	58.819	1.262
1.005	23.132	55.2	375	Circular_Default Sewer Type	60.456	58.819	1.262	60.200	58.400	1.425
1.007	12.821	42.7	150	Circular_Default Sewer Type	60.200	58.400	1.650	59.500	58.100	1.250

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	14	1200	Manhole	Adoptable	15	1200	Manhole	Adoptable
2.001	15	1200	Manhole	Adoptable	16	1200	Manhole	Adoptable
2.002	16	1200	Manhole	Adoptable	17	1200	Manhole	Adoptable
2.003	17	1200	Manhole	Adoptable	18	1200	Manhole	Adoptable
3.000	20	1200	Manhole	Adoptable	18	1200	Manhole	Adoptable
2.004	18	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
2.005	19	1200	Manhole	Adoptable	8	1350	Manhole	Adoptable
1.003	8	1350	Manhole	Adoptable	9	1350	Manhole	Adoptable
1.004	9	1350	Manhole	Adoptable	10	1350	Manhole	Adoptable
1.005	10	1350	Manhole	Adoptable	11	1350	Manhole	Adoptable
1.007	12	1200	Manhole	Adoptable	13	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
14	508982.098	154304.597	62.100	1.374	1200		0	2.000	60.726	150
15	508996.478	154315.994	61.802	1.520	1200		1	2.000	60.432	150
							0	2.001	60.282	300
16	509011.256	154331.872	61.439	1.512	1200		1	2.001	59.927	300
							0	2.002	59.927	300
17	508994.705	154347.765	61.593	1.760	1200		1	2.002	59.833	300
							0	2.003	59.833	300
20	508999.203	154372.960	61.150	1.425	1200		0	3.000	59.725	225
18	508986.596	154366.339	61.462	1.896	1200		1	3.000	59.641	225
							2	2.003	59.566	300
							0	2.004	59.566	300
19	508981.274	154383.422	61.278	1.861	1200		1	2.004	59.492	300
							0	2.005	59.417	375
8	508972.213	154401.370	61.055	1.914	1350		1	2.005	59.141	375
							0	1.003	59.141	375
9	509008.977	154420.639	60.652	1.639	1350		1	1.003	59.013	375
							0	1.004	59.013	375
10	509026.192	154429.667	60.456	1.637	1350		1	1.004	58.819	375
							0	1.005	58.819	375
11	509049.317	154430.228	60.200	1.800	1350		1	1.005	58.400	375
12	509060.226	154426.626	60.200	1.800	1200		0	1.007	58.400	150
13	509072.315	154430.896	59.500	1.400	1200		1	1.007	58.100	150

Simulation Settings

Rainfall Methodology	FEH-13	Skip Steady State	✓	Check Discharge Volume	✓
Summer CV	0.750	Drain Down Time (mins)	240	100 year 360 minute (m³)	
Winter CV	0.840	Additional Storage (m³/ha)	50.0		
Analysis Speed	Detailed	Check Discharge Rate(s)	✓		

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	6	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		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 13 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 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 minute storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	1.500	360	1.500	720	1.500	1080	1.500	1440	1.500
120	1.500	480	1.500	840	1.500	1200	1.500		
240	1.500	600	1.500	960	1.500	1320	1.500		

Node 12 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	58.400	Product Number	CTL-SHE-0058-2000-1800-2000
Design Depth (m)	1.800	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node 12 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	12.821
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	58.400	Main Channel Slope (1:X)	500.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.150

Inlets

11

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	45.0	0.0	1.800	386.6	0.0

Node 10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	60.100	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	25.000		

Node 9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	60.100	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.350
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	17.600		

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	59.850
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)
0.000	55.0	0.0	0.500	385.0	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

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	14	9	60.765	0.039	3.5	0.0747	0.0000	OK
15 minute summer	15	9	60.337	0.055	11.0	0.1477	0.0000	OK
15 minute summer	16	10	60.045	0.118	23.5	0.4331	0.0000	OK
15 minute summer	17	10	59.918	0.085	22.5	0.0961	0.0000	OK
15 minute summer	20	9	59.774	0.049	4.2	0.0980	0.0000	OK
15 minute summer	18	10	59.719	0.153	33.5	0.3715	0.0000	OK
15 minute summer	19	10	59.527	0.110	41.3	0.2894	0.0000	OK
15 minute summer	8	10	59.320	0.179	51.6	0.5978	0.0000	OK
15 minute summer	9	11	59.149	0.136	49.9	0.1945	0.0000	OK
600 minute winter	10	585	59.111	0.292	7.2	0.9354	0.0000	OK
600 minute winter	11	570	59.110	0.710	8.7	2.7904	0.0000	OK
600 minute winter	12	570	59.110	0.710	4.9	0.8028	0.0000	SURCHARGED
15 minute summer	13	1	58.100	0.000	1.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	14	2.000	15	3.2	0.896	0.144	0.0664	
15 minute summer	15	2.001	16	10.6	0.636	0.075	0.3735	
15 minute summer	16	2.002	17	22.5	1.077	0.318	0.4822	
15 minute summer	17	2.003	18	22.7	0.873	0.178	0.5329	
15 minute summer	20	3.000	18	4.1	0.561	0.104	0.1295	
15 minute summer	18	2.004	19	33.2	0.970	0.466	0.6119	
15 minute summer	19	2.005	8	41.1	1.052	0.175	0.7916	
15 minute summer	8	1.003	9	49.9	1.147	0.451	1.8086	
15 minute summer	9	1.004	10	50.2	1.547	0.251	0.6309	
600 minute winter	10	1.005	11	7.1	0.264	0.026	2.3409	
600 minute winter	11	Flow through pond	12	4.9	0.019	0.001	77.3971	
600 minute winter	12	Hydro-Brake®	13	1.4				59.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	14	9	60.797	0.071	9.9	0.1341	0.0000	OK
15 minute summer	15	9	60.376	0.094	31.5	0.2516	0.0000	OK
15 minute summer	16	9	60.144	0.217	66.8	0.7997	0.0000	OK
15 minute summer	17	10	59.984	0.151	63.0	0.1712	0.0000	OK
15 minute summer	20	10	59.923	0.198	11.7	0.3974	0.0000	OK
15 minute summer	18	10	59.911	0.345	93.9	0.8355	0.0000	SURCHARGED
600 minute winter	19	585	59.622	0.205	10.3	0.5408	0.0000	OK
600 minute winter	8	585	59.622	0.481	13.0	1.6061	0.0000	SURCHARGED
600 minute winter	9	585	59.622	0.609	12.9	0.8717	0.0000	SURCHARGED
600 minute winter	10	585	59.622	0.803	14.5	2.5725	0.0000	SURCHARGED
600 minute winter	11	585	59.622	1.222	16.6	4.8043	0.0000	OK
600 minute winter	12	585	59.622	1.222	8.9	1.3823	0.0000	SURCHARGED
15 minute summer	13	1	58.100	0.000	1.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	14	2.000	15	9.4	1.187	0.417	0.1454	
15 minute summer	15	2.001	16	30.8	0.834	0.216	0.7978	
15 minute summer	16	2.002	17	63.0	1.413	0.890	1.0204	
15 minute summer	17	2.003	18	63.8	1.117	0.500	1.0746	
15 minute summer	20	3.000	18	11.1	0.563	0.279	0.5467	
15 minute summer	18	2.004	19	92.9	1.347	1.305	1.1645	
600 minute winter	19	2.005	8	10.3	0.737	0.044	1.7288	
600 minute winter	8	1.003	9	12.9	0.775	0.117	4.5782	
600 minute winter	9	1.004	10	12.3	0.898	0.061	2.1441	
600 minute winter	10	1.005	11	13.2	0.351	0.049	2.5514	
600 minute winter	11	Flow through pond	12	8.9	0.015	0.002	192.9946	
600 minute winter	12	Hydro-Brake®	13	1.7				73.0

Results for 100 year +40% CC +6% A Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	14	11	61.079	0.353	17.6	0.6854	0.0000	SURCHARGED
15 minute winter	15	11	61.004	0.722	56.7	1.9992	0.0000	SURCHARGED
15 minute winter	16	11	60.974	1.047	107.3	4.0109	0.0000	SURCHARGED
15 minute winter	17	11	60.827	0.994	87.4	1.1237	0.0000	SURCHARGED
15 minute winter	20	11	60.706	0.981	21.0	2.0213	0.0000	SURCHARGED
15 minute winter	18	11	60.692	1.126	122.6	2.8156	0.0000	SURCHARGED
15 minute winter	19	11	60.406	0.989	159.6	2.6959	0.0000	SURCHARGED
15 minute winter	8	11	60.242	1.101	208.6	3.8014	0.0000	SURCHARGED
1440 minute winter	9	1410	60.183	1.170	11.6	3.7466	0.0000	SURCHARGED
1440 minute winter	10	1410	60.183	1.364	13.6	61.5251	0.0000	FLOOD RISK
1440 minute winter	11	1410	60.183	1.783	16.7	7.2764	0.0000	OK
1440 minute winter	12	1410	60.183	1.783	9.2	2.0166	0.0000	FLOOD RISK
15 minute summer	13	1	58.100	0.000	1.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	14	2.000	15	17.2	1.307	0.764	0.3230	
15 minute winter	15	2.001	16	48.7	0.872	0.342	1.5275	
15 minute winter	16	2.002	17	87.4	1.432	1.234	1.6158	
15 minute winter	17	2.003	18	79.8	1.134	0.625	1.4272	
15 minute winter	20	3.000	18	14.7	0.565	0.369	0.5663	
15 minute winter	18	2.004	19	119.5	1.697	1.679	1.2600	
15 minute winter	19	2.005	8	150.5	1.365	0.642	2.2176	
15 minute winter	8	1.003	9	192.4	1.745	1.741	4.5782	
1440 minute winter	9	1.004	10	11.5	0.705	0.058	2.1441	
1440 minute winter	10	1.005	11	13.5	0.297	0.050	2.5514	
1440 minute winter	11	Flow through pond	12	9.2	0.018	0.002	376.6063	
1440 minute winter	12	Hydro-Brake®	13	2.0				166.3