

8 Appendices

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Appendix A.4 – Surface Water Management Calculations

Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	4.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Existing	0.053	4.00	10.000	1000	0.000	0.000	1.000
Existing 1	0.000		10.000	1000	0.000	10.000	2.000

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)
Existing	Existing	Existing 1	10.000	0.600	9.000	8.000	1.000	10.0	1000	4.02	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)	Pro Depth (mm)	Pro Velocity (m/s)
Existing	10.602	8327.0	9.6	0.000	1.000	0.053	0.0	25	1.858

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)
Existing	10.000	10.0	1000	Circular	10.000	9.000	0.000	10.000	8.000	1.000

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
Existing	Existing	1000	Manhole	Adoptable	Existing 1	1000	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Existing	0.000	0.000	10.000	1.000	1000				
						0	Existing	9.000	1000
Existing 1	0.000	10.000	10.000	2.000	1000		1	Existing	8.000
						1	Existing	8.000	1000

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m ³ /ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	10080
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	0	0	0

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	0	0	0
100	40	0	0

Results for 2 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	Existing	10	9.028	0.028	10.6	0.0515	0.0000	OK
15 minute summer	Existing 1	10	8.027	0.027	10.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	10.6	1.889	0.001	0.0561	4.1

Results for 10 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	Existing	10	9.040	0.040	22.4	0.0730	0.0000	OK
15 minute summer	Existing 1	10	8.037	0.037	22.4	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	Existing	Existing	Existing 1	22.4	2.344	0.003	0.0956	8.7

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.046	0.046	30.2	0.0840	0.0000	OK
15 minute summer	Existing 1	10	8.043	0.043	30.2	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	Existing	Existing	Existing 1	30.2	2.535	0.004	0.1192	11.8

Results for 100 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	Existing	10	9.052	0.052	39.3	0.0952	0.0000	OK
15 minute summer	Existing 1	10	8.049	0.049	39.4	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	Existing	Existing	Existing 1	39.4	2.714	0.005	0.1451	15.3

Results for 100 year +40% CC 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	Existing	9	9.061	0.061	55.1	0.1129	0.0000	OK
15 minute summer	Existing 1	10	8.057	0.057	55.2	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	Existing	Existing	Existing 1	55.2	2.976	0.007	0.1854	21.5

Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	4.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.064	4.00	10.000	1200	-8.461	-11.284	1.500
2			10.000	1200	-8.621	12.637	1.691
3			10.000	1200	18.069	13.317	3.000
4	0.093	4.00	10.000	1200	17.783	18.173	1.500
5	0.064	4.00	10.000	1200	45.159	-11.669	1.500
6			10.000	1200	43.976	14.981	1.754
Virtual Manhole			10.000	1200	19.722	11.154	3.100

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	5	6	26.676	0.600	8.500	8.246	0.254	105.0	300	4.29	50.0
1.001	6	3	25.960	0.600	8.246	8.000	0.246	105.5	300	4.57	50.0
3.000	4	3	4.864	0.600	8.500	8.300	0.200	24.3	300	4.03	50.0
2.001	2	3	26.699	0.600	8.309	7.000	1.309	20.4	300	4.41	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)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.534	108.4	11.6	1.200	1.454	0.064	0.0	66	1.011
1.001	1.530	108.1	11.6	1.454	1.700	0.064	0.0	66	1.008
3.000	3.201	226.2	16.8	1.200	1.400	0.093	0.0	55	1.899
2.001	3.496	247.1	11.6	1.391	2.700	0.064	0.0	44	1.811

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	1	2	23.922	0.600	8.500	8.309	0.191	125.2	300	4.28	50.0
1.002	3	Virtual Manhole	2.722	0.600	7.000	6.900	0.100	27.2	300	4.59	50.0

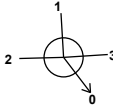
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.403	99.2	11.6	1.200	1.391	0.064	0.0	69	0.948
1.002	3.025	213.8	39.9	2.700	2.800	0.221	0.0	88	2.338

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	26.676	105.0	300	Circular	10.000	8.500	1.200	10.000	8.246	1.454
1.001	25.960	105.5	300	Circular	10.000	8.246	1.454	10.000	8.000	1.700
3.000	4.864	24.3	300	Circular	10.000	8.500	1.200	10.000	8.300	1.400
2.001	26.699	20.4	300	Circular	10.000	8.309	1.391	10.000	7.000	2.700
2.000	23.922	125.2	300	Circular	10.000	8.500	1.200	10.000	8.309	1.391
1.002	2.722	27.2	300	Circular	10.000	7.000	2.700	10.000	6.900	2.800

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.001	6	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
3.000	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
2.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
2.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	Virtual Manhole	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	-8.461	-11.284	10.000	1.500	1200					
						0	2.000	8.500	300	
2	-8.621	12.637	10.000	1.691	1200		1	2.000	8.309	300
						0	2.001	8.309	300	
3	18.069	13.317	10.000	3.000	1200		1	3.000	8.300	300
						2	2.001	7.000	300	
						3	1.001	8.000	300	
						0	1.002	7.000	300	
4	17.783	18.173	10.000	1.500	1200		0	3.000	8.500	300
5	45.159	-11.669	10.000	1.500	1200		0	1.000	8.500	300
						0	1.000	8.246	300	
6	43.976	14.981	10.000	1.754	1200		1	1.000	8.246	300
						0	1.001	8.246	300	
Virtual Manhole	19.722	11.154	10.000	3.100	1200		1	1.002	6.900	300

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Detailed	Additional Storage (m ³ /ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	10080
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0	100	0	10	0
10	0	10	0	100	40	10	0
30	0	10	0				

Node Virtual Manhole Online Weir Control

Flap Valve	x	Invert Level (m)	9.999	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	1.000		

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.000
Side Inf Coefficient (m/hr)	0.10000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	190.0	0.0	2.500	190.0	0.0	2.501	0.0	0.0

Node 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	23.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	9.700	Length (m)	23.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	1000.0		

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.582	0.082	14.1	0.1690	0.0000	OK
15 minute summer	2	9	8.360	0.051	14.1	0.0579	0.0000	OK
10080 minute winter	3	8760	7.717	0.717	0.7	130.3108	0.0000	SURCHARGED
15 minute summer	4	10	8.569	0.069	20.5	0.1723	0.0000	OK
15 minute summer	5	10	8.575	0.075	14.1	0.1545	0.0000	OK
15 minute summer	6	10	8.321	0.075	14.1	0.0844	0.0000	OK
10080 minute winter	Virtual Manhole	9960	7.718	0.818	0.1	0.9246	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	1	2.000	2	14.1	1.231	0.142	0.2776	
15 minute summer	2	2.001	3	14.5	2.208	0.059	0.2872	
10080 minute winter	3	1.002	Virtual Manhole	0.1	0.013	0.000	0.1917	
10080 minute winter	3	Infiltration		0.0				
15 minute summer	4	3.000	3	20.5	1.834	0.091	0.0544	
15 minute summer	5	1.000	6	14.1	1.049	0.130	0.3639	
15 minute summer	6	1.001	3	13.9	1.045	0.128	0.3453	
10080 minute winter	Virtual Manhole	Weir		0.0				0.0

Results for 10 year +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.621	0.121	29.8	0.2514	0.0000	OK
15 minute summer	2	10	8.379	0.070	29.8	0.0790	0.0000	OK
10080 minute summer	3	10140	8.148	1.148	1.4	208.4931	0.0000	SURCHARGED
15 minute summer	4	10	8.607	0.107	43.3	0.2662	0.0000	OK
15 minute summer	5	10	8.611	0.111	29.8	0.2304	0.0000	OK
15 minute summer	6	10	8.358	0.112	29.8	0.1267	0.0000	OK
10080 minute summer	Virtual Manhole	10200	8.148	1.248	0.1	1.4114	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	1	2.000	2	29.8	1.542	0.300	0.4685	
15 minute summer	2	2.001	3	29.8	2.343	0.121	0.7301	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.013	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
15 minute summer	4	3.000	3	43.3	2.184	0.191	0.0966	
15 minute summer	5	1.000	6	29.8	1.256	0.275	0.6368	
15 minute summer	6	1.001	3	29.7	1.283	0.275	0.6013	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.643	0.143	40.2	0.2967	0.0000	OK
10080 minute winter	2	10200	8.503	0.194	0.3	0.2195	0.0000	OK
10080 minute winter	3	9840	8.503	1.503	1.1	273.0044	0.0000	SURCHARGED
15 minute summer	4	10	8.628	0.128	58.4	0.3203	0.0000	OK
15 minute summer	5	10	8.632	0.132	40.2	0.2736	0.0000	OK
10080 minute winter	6	9780	8.503	0.257	0.3	0.2908	0.0000	OK
10080 minute winter	Virtual Manhole	9960	8.503	1.603	0.0	1.8131	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	1	2.000	2	40.2	1.671	0.405	0.5814	
10080 minute winter	2	2.001	3	0.3	0.189	0.001	1.5836	
10080 minute winter	3	1.002	Virtual Manhole	0.0	0.013	0.000	0.1917	
10080 minute winter	3	Infiltration		0.0				
15 minute summer	4	3.000	3	58.4	2.331	0.258	0.1221	
15 minute summer	5	1.000	6	40.2	1.344	0.371	0.8009	
10080 minute winter	6	1.001	3	0.3	0.340	0.003	1.7482	
10080 minute winter	Virtual Manhole	Weir		0.0				0.0

Results for 100 year +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	1	10260	8.905	0.405	0.6	0.8376	0.0000	SURCHARGED
10080 minute summer	2	10260	8.904	0.595	0.6	0.6735	0.0000	SURCHARGED
10080 minute summer	3	10200	8.904	1.904	2.1	345.8694	0.0000	SURCHARGED
10080 minute summer	4	10140	8.904	0.404	0.9	1.0087	0.0000	SURCHARGED
10080 minute summer	5	10320	8.904	0.404	0.6	0.8372	0.0000	SURCHARGED
10080 minute summer	6	10320	8.904	0.658	0.6	0.7447	0.0000	SURCHARGED
10080 minute summer	Virtual Manhole	10200	8.904	2.004	0.1	2.2668	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)
10080 minute summer	1	2.000	2	0.6	0.484	0.006	1.6846	
10080 minute summer	2	2.001	3	0.6	0.430	0.002	1.8801	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.016	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
10080 minute summer	4	3.000	3	0.9	0.773	0.004	0.3425	
10080 minute summer	5	1.000	6	0.6	0.414	0.006	1.8785	
10080 minute summer	6	1.001	3	0.6	0.413	0.006	1.8281	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	1	10140	9.733	1.233	0.9	2.5517	0.0000	FLOOD RISK
10080 minute summer	2	10140	9.733	1.424	0.9	1.6101	0.0000	FLOOD RISK
10080 minute summer	3	10140	9.733	2.733	4.8	454.4310	0.0000	FLOOD RISK
10080 minute summer	4	10260	9.733	1.233	2.3	6.4487	0.0000	FLOOD RISK
10080 minute summer	5	10140	9.733	1.233	0.9	2.5514	0.0000	FLOOD RISK
10080 minute summer	6	10140	9.733	1.487	0.9	1.6814	0.0000	FLOOD RISK
10080 minute summer	Virtual Manhole	10140	9.733	2.833	0.1	3.2039	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)
10080 minute summer	1	2.000	2	0.9	0.547	0.009	1.6846	
10080 minute summer	2	2.001	3	0.9	0.430	0.004	1.8801	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.016	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
10080 minute summer	4	3.000	3	3.6	0.857	0.016	0.3425	
10080 minute summer	5	1.000	6	0.9	0.468	0.008	1.8785	
10080 minute summer	6	1.001	3	0.9	0.433	0.008	1.8281	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	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)	21.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.370	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Existing	0.053	4.00	10.000	1000	0.000	0.000	1.000
Existing 1	0.000		10.000	1000	0.000	10.000	2.000

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)
Existing	Existing	Existing 1	10.000	0.600	9.000	8.000	1.000	10.0	1000	4.02	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)	Pro Depth (mm)	Pro Velocity (m/s)
Existing	10.602	8327.0	9.6	0.000	1.000	0.053	0.0	25	1.858

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)
Existing	10.000	10.0	1000	Circular	10.000	9.000	0.000	10.000	8.000	1.000

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
Existing	Existing	1000	Manhole	Adoptable	Existing 1	1000	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Existing	0.000	0.000	10.000	1.000	1000				
						0	Existing	9.000	1000
Existing 1	0.000	10.000	10.000	2.000	1000		1	Existing	8.000
						1	Existing	8.000	1000

Simulation Settings

Rainfall Methodology	FSR	Summer CV	1.000	Drain Down Time (mins)	240
FSR Region	England and Wales	Winter CV	1.000	Additional Storage (m³/ha)	20.0
M5-60 (mm)	21.000	Analysis Speed	Normal	Check Discharge Rate(s)	x
Ratio-R	0.370	Skip Steady State	x	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	10080
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------	-------

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	0	0	0

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	0	0	0
100	40	0	0

Results for 2 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	Existing	10	9.032	0.032	14.0	0.0585	0.0000	OK
15 minute summer	Existing 1	10	8.030	0.030	14.0	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	Existing	Existing	Existing 1	14.0	2.052	0.002	0.0682	5.5

Results for 10 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	Existing	10	9.038	0.038	20.9	0.0706	0.0000	OK
15 minute summer	Existing 1	10	8.036	0.036	20.9	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)
15 minute summer	Existing	Existing	Existing 1	20.9	2.300	0.003	0.0909	8.1

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.043	0.043	26.5	0.0791	0.0000	OK
15 minute summer	Existing 1	10	8.041	0.041	26.5	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 summer	Existing	Existing	Existing 1	26.5	2.452	0.003	0.1081	10.3

Results for 100 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	Existing	10	9.048	0.048	34.4	0.0892	0.0000	OK
15 minute summer	Existing 1	10	8.046	0.046	34.4	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	Existing	Existing	Existing 1	34.4	2.618	0.004	0.1313	13.4

Results for 100 year +40% CC 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	Existing	10	9.057	0.057	48.1	0.1053	0.0000	OK
15 minute summer	Existing 1	10	8.054	0.054	48.2	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	Existing	Existing	Existing 1	48.2	2.866	0.006	0.1681	18.7

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	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)	21.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.370	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.064	4.00	10.000	1200	-8.461	-11.284	1.500
2			10.000	1200	-8.621	12.637	1.691
3			10.000	1200	18.069	13.317	3.000
4	0.093	4.00	10.000	1200	17.783	18.173	1.500
5	0.064	4.00	10.000	1200	45.159	-11.669	1.500
6			10.000	1200	43.976	14.981	1.754
Virtual Manhole			10.000	1200	19.722	11.154	3.100

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	5	6	26.676	0.600	8.500	8.246	0.254	105.0	300	4.29	50.0
1.001	6	3	25.960	0.600	8.246	8.000	0.246	105.5	300	4.57	50.0
3.000	4	3	4.864	0.600	8.500	8.300	0.200	24.3	300	4.03	50.0
2.001	2	3	26.699	0.600	8.309	7.000	1.309	20.4	300	4.41	50.0
2.000	1	2	23.922	0.600	8.500	8.309	0.191	125.2	300	4.28	50.0
1.002	3	Virtual Manhole	2.722	0.600	7.000	6.900	0.100	27.2	300	4.59	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)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.534	108.4	11.6	1.200	1.454	0.064	0.0	66	1.011
1.001	1.530	108.1	11.6	1.454	1.700	0.064	0.0	66	1.008
3.000	3.201	226.2	16.8	1.200	1.400	0.093	0.0	55	1.899
2.001	3.496	247.1	11.6	1.391	2.700	0.064	0.0	44	1.811
2.000	1.403	99.2	11.6	1.200	1.391	0.064	0.0	69	0.948
1.002	3.025	213.8	39.9	2.700	2.800	0.221	0.0	88	2.338

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	26.676	105.0	300	Circular	10.000	8.500	1.200	10.000	8.246	1.454
1.001	25.960	105.5	300	Circular	10.000	8.246	1.454	10.000	8.000	1.700
3.000	4.864	24.3	300	Circular	10.000	8.500	1.200	10.000	8.300	1.400
2.001	26.699	20.4	300	Circular	10.000	8.309	1.391	10.000	7.000	2.700

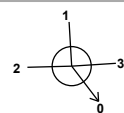
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.001	6	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
3.000	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
2.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable

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	23.922	125.2	300	Circular	10.000	8.500	1.200	10.000	8.309	1.391
1.002	2.722	27.2	300	Circular	10.000	7.000	2.700	10.000	6.900	2.800

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	Virtual Manhole	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	-8.461	-11.284	10.000	1.500	1200		0	2.000	8.500	300
2	-8.621	12.637	10.000	1.691	1200		1	2.000	8.309	300
3	18.069	13.317	10.000	3.000	1200		0	2.001	8.309	300
4	17.783	18.173	10.000	1.500	1200		1	3.000	8.300	300
5	45.159	-11.669	10.000	1.500	1200		2	2.001	7.000	300
							3	1.001	8.000	300
							0	1.002	7.000	300
							0	3.000	8.500	300
							0	1.000	8.500	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
6	43.976	14.981	10.000	1.754	1200	1 	1.000	8.246	300
						0 	1.001	8.246	300
Virtual Manhole	19.722	11.154	10.000	3.100	1200	1 	1.002	6.900	300

Simulation Settings

Rainfall Methodology	FSR	Summer CV	1.000	Drain Down Time (mins)	240
FSR Region	England and Wales	Winter CV	1.000	Additional Storage (m ³ /ha)	20.0
M5-60 (mm)	21.000	Analysis Speed	Detailed	Check Discharge Rate(s)	x
Ratio-R	0.370	Skip Steady State	x	Check Discharge Volume	x

Storm Durations

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0	100	0	10	0
10	0	10	0	100	40	10	0
30	0	10	0				

Node Virtual Manhole Online Weir Control

Flap Valve	x	Invert Level (m)	9.999	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	1.000		

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.000
Side Inf Coefficient (m/hr)	0.10000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	190.0	0.0	2.500	190.0	0.0	2.501	0.0	0.0

Node 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	23.000	Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	9.700	Length (m)	23.000	Inf Depth (m)
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	1000.0	

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.594	0.094	18.5	0.1949	0.0000	OK
15 minute summer	2	9	8.366	0.057	18.5	0.0647	0.0000	OK
10080 minute winter	3	9660	7.916	0.916	0.7	166.4120	0.0000	SURCHARGED
15 minute summer	4	10	8.581	0.081	26.9	0.2011	0.0000	OK
15 minute summer	5	10	8.586	0.086	18.5	0.1779	0.0000	OK
15 minute summer	6	10	8.332	0.086	18.5	0.0975	0.0000	OK
10080 minute winter	Virtual Manhole	9600	7.916	1.016	0.1	1.1494	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	1	2.000	2	18.5	1.346	0.186	0.3332	
15 minute summer	2	2.001	3	18.8	2.275	0.076	0.4117	
10080 minute winter	3	1.002	Virtual Manhole	-0.1	0.013	0.000	0.1917	
10080 minute winter	3	Infiltration		0.0				
15 minute summer	4	3.000	3	26.9	1.958	0.119	0.0669	
15 minute summer	5	1.000	6	18.5	1.121	0.171	0.4449	
15 minute summer	6	1.001	3	18.3	1.128	0.170	0.4220	
10080 minute winter	Virtual Manhole	Weir		0.0				0.0

Results for 10 year +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.617	0.117	27.7	0.2417	0.0000	OK
15 minute summer	2	9	8.377	0.068	27.7	0.0764	0.0000	OK
10080 minute summer	3	10200	8.231	1.231	1.4	223.5916	0.0000	SURCHARGED
15 minute summer	4	10	8.602	0.102	40.3	0.2550	0.0000	OK
15 minute summer	5	10	8.607	0.107	27.7	0.2213	0.0000	OK
15 minute summer	6	10	8.354	0.108	27.7	0.1216	0.0000	OK
10080 minute summer	Virtual Manhole	10260	8.231	1.331	0.1	1.5055	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	1	2.000	2	27.7	1.512	0.279	0.4445	
15 minute summer	2	2.001	3	27.7	2.337	0.112	0.6739	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.033	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
15 minute summer	4	3.000	3	40.3	2.149	0.178	0.0914	
15 minute summer	5	1.000	6	27.7	1.235	0.256	0.6026	
15 minute summer	6	1.001	3	27.6	1.259	0.255	0.5695	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.633	0.133	35.2	0.2754	0.0000	OK
10080 minute winter	2	10140	8.527	0.218	0.3	0.2466	0.0000	OK
10080 minute winter	3	9960	8.527	1.527	1.1	277.3506	0.0000	SURCHARGED
15 minute summer	4	10	8.618	0.118	51.2	0.2950	0.0000	OK
15 minute summer	5	10	8.622	0.122	35.2	0.2533	0.0000	OK
10080 minute winter	6	9900	8.527	0.281	0.3	0.3178	0.0000	OK
10080 minute winter	Virtual Manhole	9960	8.527	1.627	0.0	1.8402	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	1	2.000	2	35.2	1.613	0.355	0.5282	
10080 minute winter	2	2.001	3	0.3	0.189	0.001	1.6723	
10080 minute winter	3	1.002	Virtual Manhole	0.0	0.013	0.000	0.1917	
10080 minute winter	3	Infiltration		0.0				
15 minute summer	4	3.000	3	51.2	2.265	0.226	0.1101	
15 minute summer	5	1.000	6	35.2	1.305	0.325	0.7232	
10080 minute winter	6	1.001	3	0.3	0.340	0.003	1.8042	
10080 minute winter	Virtual Manhole	Weir		0.0				0.0

Results for 100 year +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	1	10200	8.831	0.331	0.6	0.6855	0.0000	SURCHARGED
10080 minute summer	2	10200	8.831	0.522	0.6	0.5905	0.0000	SURCHARGED
10080 minute summer	3	10260	8.831	1.831	2.1	332.5638	0.0000	SURCHARGED
10080 minute summer	4	10200	8.831	0.331	0.9	0.8258	0.0000	SURCHARGED
10080 minute summer	5	10320	8.831	0.331	0.6	0.6862	0.0000	SURCHARGED
10080 minute summer	6	10320	8.831	0.585	0.6	0.6620	0.0000	SURCHARGED
10080 minute summer	Virtual Manhole	10260	8.831	1.931	0.0	2.1840	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)
10080 minute summer	1	2.000	2	0.6	0.484	0.006	1.6846	
10080 minute summer	2	2.001	3	0.6	0.505	0.002	1.8801	
10080 minute summer	3	1.002	Virtual Manhole	0.0	0.029	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
10080 minute summer	4	3.000	3	0.9	0.773	0.004	0.3425	
10080 minute summer	5	1.000	6	0.6	0.414	0.006	1.8785	
10080 minute summer	6	1.001	3	0.6	0.413	0.006	1.8281	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	1	10200	9.393	0.893	0.9	1.8485	0.0000	SURCHARGED
10080 minute summer	2	10200	9.393	1.084	0.9	1.2259	0.0000	SURCHARGED
10080 minute summer	3	10260	9.393	2.393	5.2	434.5731	0.0000	SURCHARGED
10080 minute summer	4	10140	9.393	0.893	1.2	2.2272	0.0000	SURCHARGED
10080 minute summer	5	10320	9.393	0.893	0.9	1.8482	0.0000	SURCHARGED
10080 minute summer	6	10320	9.393	1.147	0.9	1.2970	0.0000	SURCHARGED
10080 minute summer	Virtual Manhole	10200	9.393	2.493	0.1	2.8192	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)
10080 minute summer	1	2.000	2	0.9	0.547	0.009	1.6846	
10080 minute summer	2	2.001	3	0.9	0.430	0.004	1.8801	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.016	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
10080 minute summer	4	3.000	3	4.2	0.837	0.019	0.3425	
10080 minute summer	5	1.000	6	0.9	0.468	0.008	1.8785	
10080 minute summer	6	1.001	3	0.9	0.433	0.008	1.8281	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Appendix A.5 – Indicative Drainage Layout



PERMEABLE PAVING
AREA DRAINING TO PAVING: 960m²
AREA OF PAVING: 530m²
SUB-BASE DEPTH: 300mm
SUB-BASE POROSITY: 0.3
INFILTRATION: NOT PERMITTED

GEO-CELLULAR SOAKAWAY
AREA DRAINING TO SOAKAWAY: 2205 m²
AREA OF PAVING: 190m²
DEPTH: 2.5m
POROSITY: 0.95
INFILTRATION: 0.1m/hr (Assumed)

PETROL INTERCEPTOR 5.3m

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GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS' DRAWINGS AND THE SPECIFICATION.
2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, EUROPEAN NORMS, CODES OF PRACTICE AND BUILDING PRACTICE.
3. ALL DIMENSIONS ARE TO BE CHECKED BY THE CONTRACTOR PRIOR TO STARTING THE WORKS ON SITE. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
4. INFILTRATION FEATURES WILL BE SUBJECT TO SITE SPECIFIC INFILTRATION TESTING AND TRIAL HOLES.
5. ALL DRAINAGE SYSTEMS WILL NEED TO BE INSTALLED AND DESIGNED FOR SUITABLE LOADING REQUIREMENTS.
6. THE CONTRACTOR SHALL OBTAIN PRIOR APPROVAL AND ALL NECESSARY LICENCES FROM THE HIGHWAY AUTHORITY AND/OR SEWERAGE UNDERTAKER BEFORE CARRYING OUT ANY WORKS.

KEY:

- SURFACE WATER DRAIN
- SURFACE WATER MANHOLE
- PETROL INTERCEPTOR
- PERMEABLE SURFACE
- GEOCELLULAR SOAKAWAY

herrington
CONSULTING LIMITED

Unit 6-7 Barham Business Park
Elham Valley Road
Canterbury
Kent CT4 6DQ

London Office
Unit D
Taper Building
London
SE1 3QB

Tel : 01227 833855
enquiries@herringtonconsulting.co.uk
www.herringtonconsulting.co.uk

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P1	First issue	SH	SMB	30/03/21

CLIENT
Avery Healthcare Group Limited

PROJECT
CENTRAL AVENUE GRAVESEND

SCALE	PROJ REF	ORIGINATOR	CHECKED BY
1:200	3085	SH	SMB

DWG REF	DWG No.
INDICATIVE DRAINAGE LAYOUT	HC-3085-501

Appendix A.6 – Maintenance Schedules

Operation and Maintenance Schedule – Pervious paving / surfacing		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (for driveways this can be a standard cosmetic sweep over whole surface).	At minimum once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – particular attention must be paid to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using a suitable weed killer which will not adversely affect water quality. Weed killer should be applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving / surfacing.	As required when damage or erosion is detected following inspection. For block paving systems jointing material to be replaced shortly after installation and subsequently when required.
	Remedial work to any depressions. Rutting and cracked or broken blocks and replace lost jointing material (where block paving is used).	
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

General Maintenance Requirements for Permeable Surfacing (additional requirements may apply depending on type of surfacing material used).

Operation and Maintenance Schedule – Crate Soakaways		
Maintenance Schedule	Required Action	Typical Frequency
Routine maintenance	Inspect for sediment and debris in pre-treatment components and storage crate system	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required based on inspections)
Occasional maintenance	Remove sediment and debris from pre-treatment components and storage crate system	As required, based on inspections
Remedial Actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of geotextile surround if not intact or clogged	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check crate system to ensure emptying is occurring	Annually

General Operation and Maintenance Table for Soakaways.