

Project:	Lucas Lane, Hitchin	Project No:	251029	Sheet No:	01	
		Date:	21/02/2025	Revision:	P01	

Design Information:

Client	Hill Partnerships Ltd (Waltham Abbey)		
Architect	Hill Residential		
British standards, Codes of Practice & Design Standards	BS EN 752	Building Regulations Part H	Hertfordshire County Council LLFA Guidance
Intended Building Usage	Residential Dwellings		
Subsoil Conditions	Topsoil over Sandy Clay		
Special Considerations	Infiltration testing failed - restricted discharge to existing Anglian Water sewer system @ 1.0 l/s		
Computer Programme	Causeway Flow		

Index:

Pages	Element	By	Rev	Date	Checked
2 - 9	Surface Water Design and Simulation Results	JS	-	21/02/25	PDC
10 - 14	Critical 1% +CC Storm with Consecutive 10% Storm	JS	-	21/02/25	PDC

Residual Hazard & Risk Assessment:

Designers Hazard and Risk Log Completed	Y	21/02/2025
Risks Transferred to Drawings	Y	21/02/2025



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	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	1.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SW1	0.108	5.00	90.800	1350	1.600
SW2	0.018	5.00	91.000	1350	1.870
SW3	0.023	5.00	91.300	1350	2.200
SW4	0.063	5.00	91.750	1350	2.450
SW5	0.000	5.00	91.400	1350	2.382
SW6	0.032	5.00	91.500	1350	2.500
SW7			91.200	1350	2.225
SW8	0.043	5.00	91.100	1800	2.470
Plot1	0.030	5.00	90.400	600	1.150
SW9	0.023	5.00	90.400	1800	1.807
SW10	0.000	5.00	89.700	1800	1.135
SW10_OUT			89.600	1200	1.049

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	SW1	SW2	18.839	0.600	89.200	89.130	0.070	269.1	450	5.25	1.0
1.001	SW2	SW3	9.635	0.600	89.130	89.100	0.030	321.2	450	5.40	1.0
1.002	SW3	SW5	26.821	0.600	89.100	89.018	0.082	327.1	450	5.80	1.0
2.000	SW4	SW5	7.502	0.600	89.300	89.243	0.057	131.6	225	5.11	1.0
1.003	SW5	SW6	6.861	0.600	89.018	89.000	0.018	381.2	450	5.91	1.0
1.004	SW6	SW7	10.485	0.600	89.000	88.975	0.025	419.4	450	6.08	1.0
1.005	SW7	SW8	16.880	0.600	88.975	88.930	0.045	375.1	450	6.35	1.0
1.006	SW8	SW9	17.561	0.600	88.630	88.593	0.037	474.6	750	6.58	1.0
3.000	Plot1	SW9	6.677	0.600	89.250	89.193	0.057	117.1	150	5.12	1.0
1.007	SW9	SW10	14.043	0.600	88.593	88.565	0.028	501.5	750	6.77	1.0

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	1.234	196.3	0.4	1.150	1.420	0.108	0.0	15	0.238
1.001	1.129	179.5	0.5	1.420	1.750	0.126	0.0	16	0.235
1.002	1.118	177.9	0.5	1.750	1.932	0.149	0.0	18	0.250
2.000	1.138	45.2	0.2	2.225	1.932	0.063	0.0	12	0.297
1.003	1.035	164.6	0.8	1.932	2.050	0.212	0.0	22	0.268
1.004	0.986	156.8	0.9	2.050	1.775	0.244	0.0	24	0.269
1.005	1.043	166.0	0.9	1.775	1.720	0.244	0.0	23	0.278
1.006	1.278	564.4	1.0	1.720	1.057	0.287	0.0	24	0.251
3.000	0.927	16.4	0.1	1.000	1.057	0.030	0.0	9	0.259
1.007	1.242	548.9	1.2	1.057	0.385	0.340	0.0	26	0.259



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	SW10	SW10_OUT	3.838	0.600	88.565	88.551	0.014	274.1	300	6.84	44.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.008	0.944	66.8	54.9	0.835	0.749	0.340	0.0	208	1.050

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s) x
Summer CV	1.000	Drain Down Time (mins)	10080	Check Discharge Volume x
Winter CV	1.000	Additional Storage (m³/ha)	0.0	

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	35	0	0
100	40	0	0

Node SW1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	89.200	Product Number	CTL-SHE-0030-5000-1400-5000
Design Depth (m)	1.400	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200

Node SW10 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	88.565	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 SW4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	89.300	Product Number	CTL-SHE-0029-5000-1500-5000
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200



Node SW8 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	88.630	Product Number	CTL-SHE-0026-5000-2500-5000
Design Depth (m)	2.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200

Node Plot1 Online Orifice Control

Flap Valve	x	Invert Level (m)	89.250	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.020		

Node SW3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	89.100	Product Number	CTL-SHE-0029-5000-1500-5000
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200

Node SW1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	6300

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	220.0	0.0	0.800	220.0	42.1	0.801	0.0	42.1

Node SW1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	90.400	Slope (1:X)	9999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.400
Safety Factor	2.0	Width (m)	20.000	Inf Depth (m)	
Porosity	0.33	Length (m)	20.000		

Node SW4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	1980

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	40.0	40.0	0.800	40.0	57.9	0.801	0.0	57.9

Node SW4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	91.300	Slope (1:X)	60.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	360	Depth (m)	0.400
Safety Factor	2.0	Width (m)	15.000	Inf Depth (m)	
Porosity	0.33	Length (m)	15.000		

Node SW8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	88.630
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	7350



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	30.0	30.0	1.600	30.0	61.1	1.601	0.0	61.1

Node SW8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	90.490	Slope (1:X)	40.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	330	Depth (m)	0.400
Safety Factor	2.0	Width (m)	15.000	Inf Depth (m)	
Porosity	0.33	Length (m)	15.000		

Node Plot1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	89.650	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	212	Depth (m)	0.500
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.33	Length (m)	11.000		

Node SW3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	6300

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	20.0	20.0	0.800	20.0	32.7	0.801	0.0	32.7

Node SW2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	90.390	Slope (1:X)	40.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	360	Depth (m)	0.400
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.33	Length (m)	10.000		



Results for 2 year Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
7200 minute summer	SW1	5040	89.369	0.169	0.5	35.5083	0.0000	OK
7200 minute summer	SW2	4320	89.357	0.227	0.3	0.3246	0.0000	OK
7200 minute summer	SW3	4320	89.357	0.257	0.4	5.2475	0.0000	OK
360 minute winter	SW4	352	89.594	0.294	1.8	11.5820	0.0000	SURCHARGED
2160 minute winter	SW5	1680	89.364	0.346	0.5	0.4946	0.0000	OK
2160 minute winter	SW6	1680	89.364	0.364	0.7	0.5204	0.0000	OK
2160 minute winter	SW7	1680	89.364	0.389	0.7	0.5562	0.0000	OK
2160 minute winter	SW8	1680	89.364	0.734	1.0	22.7760	0.0000	OK
180 minute summer	Plot1	120	89.759	0.509	2.0	2.1274	0.0000	SURCHARGED
240 minute winter	SW9	236	88.810	0.217	1.5	0.5527	0.0000	OK
240 minute winter	SW10	236	88.810	0.245	1.1	0.6240	0.0000	OK
180 minute summer	SW10_OUT	152	88.571	0.020	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)
7200 minute summer	SW1	1.000	SW2	0.2	0.170	0.001	1.2168	
7200 minute summer	SW2	1.001	SW3	0.3	0.073	0.001	0.8360	
7200 minute summer	SW3	1.002	SW5	0.3	0.167	0.002	2.9460	
360 minute winter	SW4	2.000	SW5	0.3	0.315	0.006	0.0197	
2160 minute winter	SW5	1.003	SW6	0.5	0.207	0.003	0.9191	
2160 minute winter	SW6	1.004	SW7	0.7	0.255	0.005	1.4824	
2160 minute winter	SW7	1.005	SW8	0.7	0.308	0.004	2.5504	
2160 minute winter	SW8	1.006	SW9	0.3	0.156	0.001	0.1765	
180 minute summer	Plot1	3.000	SW9	0.6	0.433	0.036	0.0090	
240 minute winter	SW9	1.007	SW10	1.1	0.143	0.002	1.6187	
240 minute winter	SW10	1.008	SW10_OUT	0.8	0.353	0.012	0.0090	74.5



Results for 10 year Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	SW1	2280	89.511	0.311	1.8	65.5081	0.0000	OK
2160 minute summer	SW2	2100	89.517	0.387	0.3	0.5538	0.0000	OK
2160 minute summer	SW3	2100	89.517	0.417	0.6	8.5197	0.0000	OK
600 minute winter	SW4	570	89.837	0.537	2.0	21.1850	0.0000	SURCHARGED
2160 minute summer	SW5	1980	89.538	0.520	0.6	0.7443	0.0000	SURCHARGED
2160 minute summer	SW6	1980	89.538	0.538	0.7	0.7700	0.0000	SURCHARGED
2160 minute summer	SW7	1980	89.538	0.563	0.7	0.8058	0.0000	SURCHARGED
2160 minute summer	SW8	1980	89.538	0.908	1.1	28.1922	0.0000	SURCHARGED
120 minute summer	Plot1	96	89.850	0.600	4.7	5.4405	0.0000	SURCHARGED
480 minute winter	SW9	480	88.998	0.405	1.5	1.0298	0.0000	OK
480 minute winter	SW10	480	88.998	0.433	1.1	1.1010	0.0000	SURCHARGED
30 minute summer	SW10_OUT	27	88.571	0.020	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)
2160 minute summer	SW1	1.000	SW2	-0.3	0.151	-0.001	2.4904	
2160 minute summer	SW2	1.001	SW3	0.3	0.088	0.002	1.4372	
2160 minute summer	SW3	1.002	SW5	0.3	0.159	0.002	4.2345	
600 minute winter	SW4	2.000	SW5	0.3	0.315	0.007	0.2900	
2160 minute summer	SW5	1.003	SW6	0.5	0.208	0.003	1.0871	
2160 minute summer	SW6	1.004	SW7	0.7	0.244	0.004	1.6613	
2160 minute summer	SW7	1.005	SW8	0.7	0.308	0.004	2.6745	
2160 minute summer	SW8	1.006	SW9	0.4	0.156	0.001	1.6676	
120 minute summer	Plot1	3.000	SW9	0.6	0.444	0.039	0.0096	
480 minute winter	SW9	1.007	SW10	1.1	0.118	0.002	3.5474	
480 minute winter	SW10	1.008	SW10_OUT	0.8	0.353	0.012	0.0090	147.3



Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5760 minute winter	SW1	5340	89.825	0.625	1.2	131.5578	0.0000	SURCHARGED
1440 minute summer	SW2	1380	90.163	1.033	0.8	1.4777	0.0000	SURCHARGED
1440 minute summer	SW3	1380	90.163	1.063	1.0	16.7302	0.0000	SURCHARGED
480 minute winter	SW4	464	91.452	2.152	4.0	36.9385	0.0000	FLOOD RISK
960 minute summer	SW5	975	90.193	1.175	1.0	1.6811	0.0000	SURCHARGED
960 minute summer	SW6	975	90.193	1.193	1.7	1.7068	0.0000	SURCHARGED
960 minute summer	SW7	975	90.193	1.218	1.2	1.7426	0.0000	SURCHARGED
960 minute summer	SW8	975	90.193	1.563	3.4	48.5156	0.0000	SURCHARGED
120 minute winter	Plot1	118	90.016	0.766	5.6	11.5296	0.0000	SURCHARGED
720 minute summer	SW9	735	89.342	0.749	2.1	1.9055	0.0000	OK
720 minute summer	SW10	735	89.342	0.777	1.2	1.9768	0.0000	SURCHARGED
720 minute summer	SW10_OUT	735	88.572	0.021	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)
5760 minute winter	SW1	1.000	SW2	-0.3	0.182	-0.002	2.9849	
1440 minute summer	SW2	1.001	SW3	0.3	0.095	0.002	1.5266	
1440 minute summer	SW3	1.002	SW5	-0.3	0.157	-0.002	4.2496	
480 minute winter	SW4	2.000	SW5	0.5	0.315	0.011	0.2984	
960 minute summer	SW5	1.003	SW6	-0.8	0.209	-0.005	1.0871	
960 minute summer	SW6	1.004	SW7	1.2	0.268	0.008	1.6613	
960 minute summer	SW7	1.005	SW8	1.1	0.307	0.007	2.6745	
960 minute summer	SW8	1.006	SW9	0.5	0.143	0.001	7.5260	
120 minute winter	Plot1	3.000	SW9	0.7	0.460	0.044	0.0105	
720 minute summer	SW9	1.007	SW10	1.2	0.082	0.002	6.1780	
720 minute summer	SW10	1.008	SW10_OUT	0.9	0.358	0.013	0.0095	233.5



Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5760 minute winter	SW1	5400	90.139	0.939	1.4	168.6476	0.0000	SURCHARGED
2160 minute winter	SW2	2100	90.687	1.557	0.8	7.9119	0.0000	SURCHARGED
2160 minute winter	SW3	2100	90.687	1.587	0.8	17.4803	0.0000	SURCHARGED
600 minute winter	SW4	585	91.637	2.337	4.2	49.5155	0.0000	FLOOD RISK
1440 minute winter	SW5	1380	90.775	1.757	0.7	2.5141	0.0000	SURCHARGED
1440 minute winter	SW6	1380	90.775	1.775	1.3	2.5399	0.0000	SURCHARGED
1440 minute winter	SW7	1380	90.775	1.800	1.3	2.5757	0.0000	SURCHARGED
1440 minute winter	SW8	1380	90.775	2.145	2.3	59.1261	0.0000	SURCHARGED
180 minute winter	Plot1	176	90.142	0.892	5.3	16.1159	0.0000	FLOOD RISK
600 minute winter	SW9	570	89.690	1.097	2.2	2.7909	0.0000	SURCHARGED
600 minute winter	SW10	570	89.690	1.125	1.2	2.8621	0.0000	FLOOD RISK
600 minute winter	SW10_OUT	570	88.574	0.023	1.0	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)
5760 minute winter	SW1	1.000	SW2	-0.3	0.180	-0.002	2.9849	
2160 minute winter	SW2	1.001	SW3	-0.6	0.055	-0.003	1.5266	
2160 minute winter	SW3	1.002	SW5	-0.3	0.159	-0.002	4.2496	
600 minute winter	SW4	2.000	SW5	0.5	0.315	0.011	0.2984	
1440 minute winter	SW5	1.003	SW6	0.6	0.210	0.004	1.0871	
1440 minute winter	SW6	1.004	SW7	1.3	0.257	0.008	1.6613	
1440 minute winter	SW7	1.005	SW8	1.2	0.308	0.007	2.6745	
1440 minute winter	SW8	1.006	SW9	0.5	0.134	0.001	7.7290	
180 minute winter	Plot1	3.000	SW9	0.8	0.468	0.047	0.1175	
600 minute winter	SW9	1.007	SW10	1.2	0.089	0.002	6.1806	
600 minute winter	SW10	1.008	SW10_OUT	1.0	0.371	0.016	0.0108	257.2



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	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	1.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SW1	0.108	5.00	90.800	1350	1.600
SW2	0.018	5.00	91.000	1350	1.870
SW3	0.023	5.00	91.300	1350	2.200
SW4	0.063	5.00	91.750	1350	2.450
SW5	0.000	5.00	91.400	1350	2.382
SW6	0.032	5.00	91.500	1350	2.500
SW7			91.200	1350	2.225
SW8	0.043	5.00	91.100	1800	2.470
Plot1	0.030	5.00	90.400	600	1.150
SW9	0.023	5.00	90.400	1800	1.807
SW10	0.000	5.00	89.700	1800	1.135
SW10_OUT			89.600	1200	1.049

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	SW1	SW2	18.839	0.600	89.200	89.130	0.070	269.1	450	5.25	1.0
1.001	SW2	SW3	9.635	0.600	89.130	89.100	0.030	321.2	450	5.40	1.0
1.002	SW3	SW5	26.821	0.600	89.100	89.018	0.082	327.1	450	5.80	1.0
2.000	SW4	SW5	7.502	0.600	89.300	89.243	0.057	131.6	225	5.11	1.0
1.003	SW5	SW6	6.861	0.600	89.018	89.000	0.018	381.2	450	5.91	1.0
1.004	SW6	SW7	10.485	0.600	89.000	88.975	0.025	419.4	450	6.08	1.0
1.005	SW7	SW8	16.880	0.600	88.975	88.930	0.045	375.1	450	6.35	1.0
1.006	SW8	SW9	17.561	0.600	88.630	88.593	0.037	474.6	750	6.58	1.0
3.000	Plot1	SW9	6.677	0.600	89.250	89.193	0.057	117.1	150	5.12	1.0
1.007	SW9	SW10	14.043	0.600	88.593	88.565	0.028	501.5	750	6.77	1.0

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	1.234	196.3	0.4	1.150	1.420	0.108	0.0	15	0.238
1.001	1.129	179.5	0.5	1.420	1.750	0.126	0.0	16	0.235
1.002	1.118	177.9	0.5	1.750	1.932	0.149	0.0	18	0.250
2.000	1.138	45.2	0.2	2.225	1.932	0.063	0.0	12	0.297
1.003	1.035	164.6	0.8	1.932	2.050	0.212	0.0	22	0.268
1.004	0.986	156.8	0.9	2.050	1.775	0.244	0.0	24	0.269
1.005	1.043	166.0	0.9	1.775	1.720	0.244	0.0	23	0.278
1.006	1.278	564.4	1.0	1.720	1.057	0.287	0.0	24	0.251
3.000	0.927	16.4	0.1	1.000	1.057	0.030	0.0	9	0.259
1.007	1.242	548.9	1.2	1.057	0.385	0.340	0.0	26	0.259



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	SW10	SW10_OUT	3.838	0.600	88.565	88.551	0.014	274.1	300	6.84	44.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.008	0.944	66.8	54.9	0.835	0.749	0.340	0.0	208	1.050

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x
Rainfall Events	Consecutive	Drain Down Time (mins)	10080
Winter CV	1.000	Additional Storage (m³/ha)	0.0
Additional Area (A %)	0	Starting Level (m)	
Additional Flow (Q %)	0	Check Discharge Rate(s)	x
Analysis Speed	Detailed	Check Discharge Volume	x

Time Offset (mins)	Duration (mins)	Return Period (years)	Climate Change (CC %)	Time Offset (mins)	Duration (mins)	Return Period (years)	Climate Change (CC %)
0	5400	100	40	1440	2280	10	0

Node SW1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	89.200	Product Number	CTL-SHE-0030-5000-1400-5000
Design Depth (m)	1.400	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200

Node SW10 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	88.565	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 SW4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	89.300	Product Number	CTL-SHE-0029-5000-1500-5000
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200

Node SW8 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	88.630	Product Number	CTL-SHE-0026-5000-2500-5000
Design Depth (m)	2.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200



Node Plot1 Online Orifice Control

Flap Valve	x	Invert Level (m)	89.250	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.020		

Node SW3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	89.100	Product Number	CTL-SHE-0029-5000-1500-5000
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.5	Min Node Diameter (mm)	1200

Node SW1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	6240

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	220.0	0.0	0.800	220.0	42.1	0.801	0.0	42.1

Node SW1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	90.400	Slope (1:X)	9999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	1680	Depth (m)	0.400
Safety Factor	2.0	Width (m)	20.000	Inf Depth (m)	
Porosity	0.33	Length (m)	20.000		

Node SW4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	4800

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	40.0	40.0	0.800	40.0	57.9	0.801	0.0	57.9

Node SW4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	91.300	Slope (1:X)	60.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	240	Depth (m)	0.400
Safety Factor	2.0	Width (m)	15.000	Inf Depth (m)	
Porosity	0.33	Length (m)	15.000		

Node SW8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	88.630
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	30.0	30.0	1.600	30.0	61.1	1.601	0.0	61.1



Node SW8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	90.490	Slope (1:X)	40.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	540	Depth (m)	0.400
Safety Factor	2.0	Width (m)	15.000	Inf Depth (m)	
Porosity	0.33	Length (m)	15.000		

Node Plot1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	89.650	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.500
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.33	Length (m)	11.000		

Node SW3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.100
Side Inf Coefficient (m/hr)	0.00000	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	20.0	20.0	0.800	20.0	32.7	0.801	0.0	32.7

Node SW2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	90.390	Slope (1:X)	40.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	1200	Depth (m)	0.400
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.33	Length (m)	10.000		



Results for Consecutive Rainfall Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5400-2280	SW1	9060	90.720	1.520	1.4	211.6389	0.0000	FLOOD RISK
5400-2280	SW2	8700	90.708	1.578	0.6	8.6452	0.0000	FLOOD RISK
5400-2280	SW3	8700	90.708	1.608	0.4	17.5108	0.0000	SURCHARGED
5400-2280	SW4	8340	91.427	2.127	0.7	35.8699	0.0000	SURCHARGED
5400-2280	SW5	8640	90.720	1.702	0.6	2.4360	0.0000	SURCHARGED
5400-2280	SW6	8640	90.720	1.720	0.8	2.4618	0.0000	SURCHARGED
5400-2280	SW7	8640	90.720	1.745	0.8	2.4975	0.0000	SURCHARGED
5400-2280	SW8	8640	90.720	2.090	1.1	56.2013	0.0000	SURCHARGED
5400-2280	Plot1	2580	89.393	0.143	0.3	0.0406	0.0000	OK
5400-2280	SW9	8280	88.783	0.190	0.9	0.4839	0.0000	OK
5400-2280	SW10	8280	88.783	0.218	0.9	0.5552	0.0000	OK
5400-2280	SW10_OUT	8280	88.571	0.020	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)
5400-2280	SW1	1.000	SW2	-0.3	0.178	-0.002	2.9849	
5400-2280	SW2	1.001	SW3	-0.4	0.085	-0.002	1.5266	
5400-2280	SW3	1.002	SW5	0.3	0.158	0.002	4.2496	
5400-2280	SW4	2.000	SW5	0.4	0.303	0.008	0.2984	
5400-2280	SW5	1.003	SW6	0.5	0.182	0.003	1.0871	
5400-2280	SW6	1.004	SW7	0.8	0.219	0.005	1.6613	
5400-2280	SW7	1.005	SW8	0.7	0.302	0.004	2.6745	
5400-2280	SW8	1.006	SW9	0.5	0.141	0.001	1.3350	
5400-2280	Plot1	3.000	SW9	0.3	0.356	0.018	0.0056	
5400-2280	SW9	1.007	SW10	0.9	0.049	0.002	1.3613	
5400-2280	SW10	1.008	SW10_OUT	0.8	0.353	0.012	0.0090	502.2