

TWEDDELL & SLATER CONSULTING CIVIL & STRUCTURAL ENGINEERS	Tweddell & Slater Ltd	File: 7829 - Flow Calc - Without Impe Network: Storm Network Simon Johnston 11/01/2023	Page 1																																																																																																																																																																																
Design Settings <table><tr><td>Rainfall Methodology</td><td>FSR</td><td>Maximum Time of Concentration (mins)</td><td>30.00</td></tr><tr><td>Return Period (years)</td><td>100</td><td>Maximum Rainfall (mm/hr)</td><td>50.0</td></tr><tr><td>Additional Flow (%)</td><td>10</td><td>Minimum Velocity (m/s)</td><td>1.00</td></tr><tr><td>FSR Region</td><td>England and Wales</td><td>Connection Type</td><td>Level Soffits</td></tr><tr><td>M5-60 (mm)</td><td>20.000</td><td>Minimum Backdrop Height (m)</td><td>0.200</td></tr><tr><td>Ratio-R</td><td>0.300</td><td>Preferred Cover Depth (m)</td><td>0.500</td></tr><tr><td>CV</td><td>1.000</td><td>Include Intermediate Ground</td><td>x</td></tr><tr><td>Time of Entry (mins)</td><td>2.00</td><td>Enforce best practice design rules</td><td>x</td></tr></table>				Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00	Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Additional Flow (%)	10	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	0.300	Preferred Cover Depth (m)	0.500	CV	1.000	Include Intermediate Ground	x	Time of Entry (mins)	2.00	Enforce best practice design rules	x																																																																																																																																																
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Simulation Settings

100 year (l/s)	1.0	100 year +50% 360 minute (m³)	35
Check Discharge Volume	✓		

Storm Durations

15	30	60	120	180	240	360
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	50	10	0
2	50	10	0
30	50	10	0
100	50	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.70
Greenfield Method	IH124	Growth Factor 100 year	2.08
Positively Drained Area (ha)	0.060	Betterment (%)	0
SAAR (mm)	1045	QBar	0.5
Soil Index	4	Q 1 year (l/s)	0.4
SPR	0.47	Q 2 year (l/s)	0.4
Region	10	Q 30 year (l/s)	0.8
Growth Factor 1 year	0.87	Q 100 year (l/s)	1.0
Growth Factor 2 year	0.93		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	50
Positively Drained Area (ha)	0.060	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.554
CWI	125.113	Runoff Volume (m³)	35

Node HYDROBRAKE Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	21.435	Product Number	CTL-SHE-0113-5000-0450-5000
Design Depth (m)	0.450	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Results for 1 year +50% CC +10% A 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	SW1	9	21.829	0.029	1.5	0.0086	0.0000	OK
15 minute summer	SW2	9	21.637	0.041	3.0	0.0108	0.0000	OK
15 minute summer	SW3	9	21.875	0.025	1.5	0.0076	0.0000	OK
15 minute summer	SW4	10	21.547	0.062	5.5	0.0140	0.0000	OK
15 minute summer	TANK INLET	10	21.535	0.070	5.1	0.0000	0.0000	OK
15 minute summer	TANK OUTLET	10	21.535	0.080	4.3	0.0000	0.0000	OK
15 minute summer	HYDROBRAKE	10	21.535	0.100	4.0	0.1129	0.0000	OK
15 minute summer	OUTFALL	1	21.270	0.000	3.9	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	SW1	1.000	SW2	1.5	0.472	0.084	0.0647	
15 minute summer	SW2	1.001	SW4	2.9	0.567	0.166	0.0580	
15 minute summer	SW3	2.000	SW4	1.5	0.408	0.060	0.0775	
15 minute summer	SW4	1.002	TANK INLET	5.1	0.955	0.286	0.0148	
15 minute summer	TANK INLET	1.003	TANK OUTLET	4.3	0.077	0.006	0.1495	
15 minute summer	TANK OUTLET	1.004	HYDROBRAKE	4.0	0.485	0.226	0.0220	
15 minute summer	HYDROBRAKE	Hydro-Brake®	OUTFALL	3.9				1.7

Results for 2 year +50% CC +10% A 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	SW1	9	21.833	0.033	1.9	0.0097	0.0000	OK
15 minute summer	SW2	9	21.643	0.047	3.8	0.0122	0.0000	OK
15 minute summer	SW3	9	21.878	0.028	1.9	0.0085	0.0000	OK
15 minute summer	SW4	10	21.561	0.076	7.1	0.0171	0.0000	OK
15 minute summer	TANK INLET	10	21.556	0.091	6.4	0.0000	0.0000	OK
15 minute summer	TANK OUTLET	10	21.556	0.101	5.6	0.0000	0.0000	OK
15 minute summer	HYDROBRAKE	10	21.555	0.120	4.9	0.1361	0.0000	OK
15 minute summer	OUTFALL	1	21.270	0.000	4.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	1.000	SW2	1.9	0.505	0.106	0.0767	
15 minute summer	SW2	1.001	SW4	3.7	0.576	0.210	0.0723	
15 minute summer	SW3	2.000	SW4	1.9	0.425	0.076	0.0978	
15 minute summer	SW4	1.002	TANK INLET	6.4	0.998	0.358	0.0201	
15 minute summer	TANK INLET	1.003	TANK OUTLET	5.6	0.079	0.008	0.1926	
15 minute summer	TANK OUTLET	1.004	HYDROBRAKE	4.9	0.551	0.277	0.0278	
15 minute summer	HYDROBRAKE	Hydro-Brake®	OUTFALL	4.8				2.2

Results for 30 year +50% CC +10% A 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	SW1	9	21.846	0.046	3.7	0.0136	0.0000	OK
15 minute summer	SW2	11	21.690	0.094	7.4	0.0245	0.0000	OK
15 minute summer	SW3	9	21.889	0.039	3.7	0.0119	0.0000	OK
15 minute summer	SW4	11	21.690	0.205	13.8	0.0464	0.0000	SURCHARGED
15 minute summer	TANK INLET	11	21.687	0.222	10.2	0.0000	0.0000	OK
15 minute summer	TANK OUTLET	11	21.687	0.232	8.3	0.0000	0.0000	SURCHARGED
15 minute summer	HYDROBRAKE	11	21.684	0.249	6.1	0.2821	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	21.270	0.000	5.0	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	SW1	1.000	SW2	3.7	0.607	0.208	0.1432	
15 minute summer	SW2	1.001	SW4	7.3	0.661	0.413	0.1618	
15 minute summer	SW3	2.000	SW4	3.7	0.452	0.147	0.1951	
15 minute summer	SW4	1.002	TANK INLET	10.2	1.072	0.575	0.0352	
15 minute summer	TANK INLET	1.003	TANK OUTLET	8.3	0.111	0.013	0.4541	
15 minute summer	TANK OUTLET	1.004	HYDROBRAKE	6.1	0.539	0.341	0.0352	
15 minute summer	HYDROBRAKE	Hydro-Brake®	OUTFALL	5.0				4.3

Results for 100 year +50% CC +10% A 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	SW1	9	21.853	0.053	4.8	0.0156	0.0000	OK
30 minute summer	SW2	20	21.811	0.215	7.9	0.0562	0.0000	SURCHARGED
15 minute summer	SW3	9	21.894	0.044	4.8	0.0136	0.0000	OK
30 minute summer	SW4	20	21.808	0.323	12.8	0.0733	0.0000	SURCHARGED
30 minute summer	TANK INLET	21	21.806	0.341	10.9	0.0000	0.0000	OK
30 minute summer	TANK OUTLET	21	21.806	0.351	8.6	0.0000	0.0000	SURCHARGED
30 minute summer	HYDROBRAKE	21	21.803	0.368	6.3	0.4167	0.0000	FLOOD RISK
15 minute summer	OUTFALL	1	21.270	0.000	5.0	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	SW1	1.000	SW2	4.8	0.648	0.270	0.2230	
30 minute summer	SW2	1.001	SW4	6.2	0.579	0.349	0.1954	
15 minute summer	SW3	2.000	SW4	4.8	0.469	0.191	0.2021	
30 minute summer	SW4	1.002	TANK INLET	10.9	1.027	0.614	0.0352	
30 minute summer	TANK INLET	1.003	TANK OUTLET	8.6	0.112	0.013	0.6914	
30 minute summer	TANK OUTLET	1.004	HYDROBRAKE	6.3	0.556	0.353	0.0352	
30 minute summer	HYDROBRAKE	Hydro-Brake®	OUTFALL	5.0				7.6