Curtins | Building a better future

Trinity Islands – Plot C1, Manchester

Surcharged Surface Water Calculations

Curtins Ref: C1-Z1-CUR-G580-CA-GRD-92500

Revision: P02

Issue Date: 17 October 2025

Client Name: Renaker Build Ltd

Site Address: Site C (Buildings C1),Trinity Islands, Manchester

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)	17.000	Minimum Backdrop Height (m)	0.500
Ratio-R	0.400	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	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)
S1	0.027	5.00	26.150	600	382832.588	397810.859	1.125
S2	0.026	5.00	26.100	600	382849.634	397827.724	1.220
S3	0.016	5.00	26.170	1200	382869.044	397851.684	1.552
S4	0.031	5.00	26.200	1200	382865.591	397857.206	1.609
S5	0.061	5.00	26.110	600	382850.466	397879.848	1.770
S6			26.100	1200	382849.722	397881.717	1.770
S7			26.110	1200	382845.482	397887.136	1.808
S8	0.054	5.00	26.050	1200	382839.584	397894.675	1.912
S9	0.054	5.00	25.480	1200	382821.104	397886.325	1.440
S10	0.013	5.00	25.450	1200	382813.807	397883.029	1.437
S11	0.073	5.00	25.190	1200	382784.615	397867.027	1.150
S12	0.037	5.00	25.450	1200	382793.183	397873.711	1.512
C1 OUTFALL			25.250		382788.423	397878.557	1.335

Links (Input)

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	S1	S2	23.979	0.600	25.025	24.880	0.145	165.0	225	5.39	50.0
1.001	S2	S3	30.836	0.600	24.880	24.693	0.187	165.0	225	5.90	50.0
1.002	S3	S4	6.513	0.600	24.618	24.591	0.027	245.0	300	6.01	50.0
1.003	S4	S6	29.200	0.600	24.591	24.330	0.261	111.9	300	6.34	50.0
2.000	S5	S6	2.012	0.600	24.340	24.330	0.010	201.2	225	5.04	50.0
1.004	S6	S7	6.881	0.600	24.330	24.302	0.028	245.0	300	6.45	50.0
1.005	S7	S8	9.572	0.600	24.302	24.255	0.047	203.7	300	6.60	50.0
1.006	S8	S9	20.279	0.600	24.138	24.040	0.098	206.9	375	6.87	50.0
1.007	S9	S10	8.007	0.600	24.040	24.013	0.027	300.0	375	6.99	50.0
1.008	S10	S12	22.631	0.600	24.013	23.938	0.075	300.0	375	7.36	50.0
3.000	S11	S12	10.867	0.600	24.040	23.938	0.102	106.5	375	5.10	50.0
1.009	S12	C1 OUTFALL	6.793	0.600	23.938	23.915	0.023	300.0	375	7.47	50.0

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	382832.588	397810.859	26.150	1.125	600	0	1.000	25.025	225
S2	382849.634	397827.724	26.100	1.220	600	1 0	1.000 1.001	24.880 24.880	225 225
S3	382869.044	397851.684	26.170	1.552	1200	1 0	1.001 1.002	24.693 24.618	225 300
S4	382865.591	397857.206	26.200	1.609	1200	1 0	1.002 1.003	24.591 24.591	300 300
S5	382850.466	397879.848	26.110	1.770	600	0	2.000	24.340	225
S6	382849.722	397881.717	26.100	1.770	1200	1 2 0	2.000 1.003 1.004	24.330 24.330 24.330	225 300 300
S7	382845.482	397887.136	26.110	1.808	1200	1 0	1.004 1.005	24.302 24.302	300 300
S8	382839.584	397894.675	26.050	1.912	1200	1 0	1.005 1.006	24.255 24.138	300 375

Flow+ v15.0 Copyright © 1988-2025 Causeway Technologies Ltd

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S9	382821.104	397886.325	25.480	1.440	1200	1	1.006	24.040	375
						0	1.007	24.040	375
S10	382813.807	397883.029	25.450	1.437	1200	1	1.007	24.013	375
						0	1.008	24.013	375
S11	382784.615	397867.027	25.190	1.150	1200	0	3.000	24.040	375
S12	382793.183	397873.711	25.450	1.512	1200	1	3.000	23.938	375
						2	1.008	23.938	375
						0	1.009	23.938	375
C1 OUTFALL	382788.423	397878.557	25.250	1.335		1	1.009	23.915	375

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Additional Storage (m³/ha)	0.0
Rainfall Events	Singular	Winter CV	0.840	Starting Level (m)	
FSR Region	England and Wales	Analysis Speed	Detailed	Check Discharge Rate(s)	x
M5-60 (mm)	17.000	Skip Steady State	x	Check Discharge Volume	x
Ratio-R	0.400	Drain Down Time (mins)	240		

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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	100	40	0	0
30	0	0	0				

Node C1 OUTFALL 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 30yr, 100yr+40% CC 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)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	1.625	180	1.625	360	1.625	540	1.625	720	1.625	900	1.625	1080	1.625	1260	1.625	1440	1.625		
60	1.625	240	1.625	420	1.625	600	1.625	780	1.625	960	1.625	1140	1.625	1320	1.625				
120	1.625	300	1.625	480	1.625	660	1.625	840	1.625	1020	1.625	1200	1.625	1380	1.625				

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	7.000	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	21.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	7.000	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	35.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	15.000	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	37.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	16.700	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	21.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Width (m)	5.500	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	12.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Flow+ v15.0 Copyright © 1988-2025 Causeway Technologies Ltd

Node PP6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	7.600	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	11.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	9.600	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	15.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	4.500	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	13.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	7.300	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	19.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	8.000	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	12.400	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP11 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	11.600	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	3.800	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	5.800	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	8.700	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP13 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	10.000	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP14 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	12.200	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	9.800	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP15 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	11.200	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	10.700	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Node PP16 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	10.000	Depth (m)	0.190
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	0.000	Length (m)	17.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	400.0		

Flow+ v15.0 Copyright © 1988-2025 Causeway Technologies Ltd

Results for 1 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 winter	S1	10	25.067	0.042	3.2	0.0120	0.0000	OK
15 minute winter	S2	11	24.940	0.060	6.2	0.0169	0.0000	OK
15 minute winter	S3	11	24.690	0.072	7.9	0.0809	0.0000	OK
15 minute winter	S4	11	24.657	0.066	11.4	0.0748	0.0000	OK
15 minute winter	S5	11	24.448	0.108	7.3	0.0305	0.0000	OK
15 minute winter	S6	11	24.444	0.114	18.2	0.1292	0.0000	OK
15 minute winter	S7	11	24.408	0.106	18.2	0.1194	0.0000	OK
15 minute winter	S8	11	24.246	0.108	24.2	0.1225	0.0000	OK
15 minute winter	S9	11	24.188	0.148	30.3	0.1677	0.0000	OK
15 minute winter	S10	11	24.156	0.143	31.4	0.1612	0.0000	OK
15 minute winter	S11	12	24.104	0.064	8.7	0.0722	0.0000	OK
15 minute winter	S12	11	24.108	0.170	43.4	0.1922	0.0000	OK
15 minute winter	C1 OUTFALL	12	24.064	0.149	42.3	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	S1	1.000	S2	3.1	0.474	0.078	0.1612	
15 minute winter	S2	1.001	S3	6.1	0.730	0.150	0.2557	
15 minute winter	S3	1.002	S4	7.9	0.647	0.111	0.0793	
15 minute winter	S4	1.003	S6	11.4	0.640	0.109	0.5275	
15 minute winter	S5	2.000	S6	7.2	0.492	0.196	0.0392	
15 minute winter	S6	1.004	S7	18.2	0.779	0.257	0.1608	
15 minute winter	S7	1.005	S8	18.1	0.864	0.234	0.2008	
15 minute winter	S8	1.006	S9	24.2	0.727	0.174	0.6775	
15 minute winter	S9	1.007	S10	29.9	0.759	0.260	0.3158	
15 minute winter	S10	1.008	S12	31.0	0.719	0.269	0.9833	
15 minute winter	S11	3.000	S12	8.5	0.411	0.044	0.3308	
15 minute winter	S12	1.009	C1 OUTFALL	42.3	0.953	0.368	0.3024	21.5

Flow+ v15.0 Copyright © 1988-2025 Causeway Technologies Ltd

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	12	25.854	0.829	8.6	0.2345	0.0000	FLOOD RISK
15 minute summer	S2	12	25.912	1.032	23.0	0.2919	0.0000	FLOOD RISK
30 minute summer	S3	18	25.823	1.205	22.8	1.3626	0.0000	SURCHARGED
30 minute summer	S4	18	25.816	1.225	28.4	1.3849	0.0000	SURCHARGED
15 minute winter	S5	11	25.790	1.450	17.8	0.4102	0.0000	SURCHARGED
15 minute winter	S6	11	25.782	1.452	50.6	1.6421	0.0000	SURCHARGED
15 minute winter	S7	11	25.757	1.455	51.7	1.6452	0.0000	SURCHARGED
15 minute winter	S8	11	25.709	1.571	64.6	1.7764	0.0000	SURCHARGED
15 minute summer	S9	11	25.480	1.440	69.4	1.8053	0.0000	FLOOD RISK
15 minute summer	S10	11	25.450	1.437	73.7	1.8104	0.0000	FLOOD RISK
15 minute summer	S11	11	25.190	1.150	20.2	1.7393	0.0000	FLOOD RISK
15 minute summer	S12	11	25.450	1.512	100.0	1.8525	0.0000	FLOOD RISK
15 minute summer	C1 OUTFALL	1	25.540	1.625	101.2	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	S1	1.000	S2	7.8	0.596	0.194	0.9537	
15 minute summer	S2	1.001	S3	17.5	0.864	0.433	1.2264	
30 minute summer	S3	1.002	S4	21.4	0.623	0.302	0.4586	
30 minute summer	S4	1.003	S6	31.8	0.582	0.303	2.0562	
15 minute winter	S5	2.000	S6	16.2	0.687	0.445	0.0800	
15 minute winter	S6	1.004	S7	51.7	0.806	0.731	0.4846	
15 minute winter	S7	1.005	S8	52.3	0.839	0.674	0.6741	
15 minute winter	S8	1.006	S9	65.3	0.592	0.471	2.2367	
15 minute summer	S9	1.007	S10	70.9	0.643	0.617	0.8831	
15 minute summer	S10	1.008	S12	76.2	0.691	0.663	2.4961	
15 minute summer	S11	3.000	S12	26.3	0.531	0.136	1.1986	
15 minute summer	S12	1.009	C1 OUTFALL	101.2	0.918	0.881	0.7492	17.1

Flow+ v15.0 Copyright © 1988-2025 Causeway Technologies Ltd

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.12%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	26.128	1.103	18.8	0.3122	0.0000	FLOOD RISK
15 minute winter	S2	10	26.100	1.220	31.1	0.3453	1.9378	FLOOD
15 minute winter	S3	10	26.095	1.477	26.7	1.6709	0.0000	FLOOD RISK
15 minute winter	S4	10	26.094	1.503	38.9	1.6994	0.0000	FLOOD RISK
15 minute winter	S5	10	26.071	1.731	32.1	0.4898	0.0000	FLOOD RISK
15 minute winter	S6	10	26.048	1.718	69.6	1.9431	0.0000	FLOOD RISK
15 minute winter	S7	10	25.994	1.692	67.9	1.9141	0.0000	FLOOD RISK
15 minute winter	S8	10	25.931	1.793	94.8	2.0282	0.0000	FLOOD RISK
15 minute summer	S9	9	25.480	1.440	119.8	2.0464	0.0000	FLOOD RISK
15 minute summer	S10	9	25.450	1.437	126.7	2.0097	0.0000	FLOOD RISK
15 minute summer	S11	9	25.190	1.150	36.5	1.8430	0.0000	FLOOD RISK
15 minute summer	S12	9	25.450	1.512	180.1	1.9520	0.0000	FLOOD RISK
15 minute summer	C1 OUTFALL	1	25.540	1.625	180.4	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 winter	S1	1.000	S2	13.6	0.623	0.337	0.9537	
15 minute winter	S2	1.001	S3	21.9	0.870	0.542	1.2264	
15 minute winter	S3	1.002	S4	29.5	0.776	0.418	0.4586	
15 minute winter	S4	1.003	S6	41.6	0.705	0.396	2.0562	
15 minute winter	S5	2.000	S6	30.9	0.776	0.845	0.0800	
15 minute winter	S6	1.004	S7	67.9	0.965	0.961	0.4846	
15 minute winter	S7	1.005	S8	68.3	0.970	0.880	0.6741	
15 minute winter	S8	1.006	S9	94.9	0.861	0.684	2.2367	
15 minute summer	S9	1.007	S10	120.5	1.092	1.048	0.8831	
15 minute summer	S10	1.008	S12	127.2	1.154	1.107	2.4961	
15 minute summer	S11	3.000	S12	35.7	0.571	0.184	1.1986	
15 minute summer	S12	1.009	C1 OUTFALL	180.4	1.636	1.570	0.7492	54.4

Flow+ v15.0 Copyright © 1988-2025 Causeway Technologies Ltd