

Edge Consulting UK		Page 0
Barton Arcade Manchester M3 2BH		
Date 05/06/2023 14:57	Designed by phill	
File SURFACE WATER NETWORK 3.MDX	Checked by	
XP Solutions	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
1.000	24.353	0.061	399.2	0.074	5.00	0.0	0.600	o	600	Pipe/Conduit		🔒
2.000	9.129	0.023	396.9	0.079	5.00	0.0	0.600	o	600	Pipe/Conduit		🔒
1.001	28.133	0.070	401.9	0.077	0.00	0.0	0.600	o	750	Pipe/Conduit		🔓
1.002	6.868	1.345	5.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		🔒

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	100.00	5.33	53.271	0.074	0.0	0.0	0.0	1.21	342.8	22.7
2.000	100.00	5.13	53.233	0.079	0.0	0.0	0.0	1.22	343.9	24.2
1.001	100.00	5.67	53.060	0.230	0.0	0.0	0.0	1.39	613.9	70.6
1.002	100.00	5.69	52.990	0.230	0.0	0.0	0.0	5.83	231.8	70.6

Edge Consulting UK		Page 3
Barton Arcade Manchester M3 2BH		
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Simulation Criteria for SURFACE WATER NETWORK 3

Volumetric Runoff Coeff 0.850	Additional Flow - % of Total Flow 0.000
Areal Reduction Factor 1.000	MADD Factor * 10m ³ /ha Storage 2.000
Hot Start (mins) 0	Inlet Coefficient 0.800
Hot Start Level (mm) 0	Flow per Person per Day (l/per/day) 0.000
Manhole Headloss Coeff (Global) 0.500	Run Time (mins) 60
Foul Sewage per hectare (l/s) 0.000	Output Interval (mins) 1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type Summer
Return Period (years)	30	Cv (Summer) 0.850
Region England and Wales		Cv (Winter) 0.840
M5-60 (mm)	18.000	Storm Duration (mins) 30
Ratio R	0.357	

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Edge Consulting UK		Page 4
Barton Arcade Manchester M3 2BH		
Date 05/06/2023 14:57	Designed by phill	
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Online Controls for SURFACE WATER NETWORK 3

Hydro-Brake® Optimum Manhole: SW26, DS/PN: 1.002, Volume (m³): 19.1

Unit Reference	MD-SHE-0173-1740-1950-1740
Design Head (m)	1.950
Design Flow (l/s)	17.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	173
Invert Level (m)	52.990
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.950	17.4	Kick-Flo®	1.197	13.8
Flush-Flo™	0.568	17.3	Mean Flow over Head Range	-	15.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.1	1.200	13.8	3.000	21.3	7.000	32.0
0.200	14.6	1.400	14.8	3.500	23.0	7.500	33.1
0.300	16.2	1.600	15.8	4.000	24.5	8.000	34.2
0.400	16.9	1.800	16.7	4.500	25.9	8.500	35.2
0.500	17.3	2.000	17.6	5.000	27.2	9.000	36.2
0.600	17.3	2.200	18.4	5.500	28.5	9.500	37.1
0.800	16.9	2.400	19.2	6.000	29.7		
1.000	16.0	2.600	19.9	6.500	30.9		

Simulation Criteria

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	0	Number of Real Time Controls	0

Rainfall Model	FSR	Ratio R	0.354
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Structure - (51)	SW24 60	Winter	100	+40%	100/15	Summer	
2.000		SW25 60	Winter	100	+40%	100/15	Summer	
1.001		SW25 60	Winter	100	+40%	100/15	Summer	
1.002		SW26 60	Winter	100	+40%	100/15	Summer	

PN	US/MH Name		Water	Surcharged	Flooded			Half Drain	Pipe	Status
			Level	Depth	Volume	Flow /	Overflow	Time	Flow	
			(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	
1.000	Structure -	SW24	54.954	1.083	0.000	0.06			16.6	FLOOD RISK
2.000		(51)	54.954	1.121	0.000	0.10			18.3	SURCHARGED
1.001		SW25	54.953	1.143	0.000	0.08			35.8	SURCHARGED
1.002		SW26	54.951	1.736	0.000	0.11			17.4	FLOOD RISK

Edge Consulting UK		Page 6
Barton Arcade Manchester M3 2BH		
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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for SURFACE WATER NETWORK 3</u>		