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Barton Arcade Manchester M3 2BH		
Date 15/06/2022 12:00	Designed by phill	
File 200903-EDGE-_SW-PARCEL ...	Checked by	
XP Solutions		Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for PARCEL B SW

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.600
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	3.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.000
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for PARCEL B SW

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	35.427	0.089	398.1	0.206	5.00	0.0	0.600	o	1200	Pipe/Conduit	
1.001	22.934	0.057	402.4	0.042	0.00	0.0	0.600	o	1200	Pipe/Conduit	
1.002	45.250	0.141	320.9	0.112	0.00	0.0	0.600	o	1200	Pipe/Conduit	
2.000	11.059	0.028	395.0	0.000	5.00	0.0	0.600	o	1200	Pipe/Conduit	
1.003	8.243	0.048	171.7	0.066	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	40.429	0.264	153.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	5.738	0.048	120.0	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	66.406	0.459	144.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	2.580	0.020	130.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.32	57.734	0.206	0.0	0.0	0.0	1.87	2113.8	27.9
1.001	50.00	5.52	57.645	0.248	0.0	0.0	0.0	1.86	2102.4	33.6
1.002	50.00	5.88	57.588	0.360	0.0	0.0	0.0	2.08	2355.8	48.7
2.000	50.00	5.10	57.475	0.000	0.0	0.0	0.0	1.88	2122.1	0.0
1.003	50.00	6.00	57.447	0.426	0.0	0.0	0.0	1.20	84.6	57.7
1.004	50.00	6.53	57.399	0.426	0.0	0.0	0.0	1.27	89.7	57.7
3.000	50.00	5.08	57.258	0.000	0.0	0.0	0.0	1.19	47.4	0.0
1.005	50.00	7.38	57.135	0.426	0.0	0.0	0.0	1.31	92.2	57.7
1.006	50.00	7.41	56.676	0.426	0.0	0.0	0.0	1.38	97.4	57.7

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Manhole Schedules for PARCEL B SW

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Back (m)
S2	61.279	3.545	Open Manhole	2700	1.000	57.734	1200				
S3	61.670	4.025	Open Manhole	2700	1.001	57.645	1200	1.000	57.645	1200	
S5	61.506	3.918	Open Manhole	2700	1.002	57.588	1200	1.001	57.588	1200	
4	60.051	2.576	Open Manhole	2700	2.000	57.475	1200				
S6 HYDROBRAKE	60.462	3.015	Open Manhole	2700	1.003	57.447	300	1.002	57.447	1200	
								2.000	57.447	1200	
S7	60.510	3.111	Open Manhole	1200	1.004	57.399	300	1.003	57.399	300	
S8	58.683	1.425	Open Manhole	1200	3.000	57.258	225				
S9	58.901	1.766	Open Manhole	1200	1.005	57.135	300	1.004	57.135	300	
								3.000	57.210	225	
S10	59.145	2.469	Open Manhole	1200	1.006	56.676	300	1.005	56.676	300	
EX MH5312	59.136	2.480	Open Manhole	225		OUTFALL		1.006	56.656	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2	372624.676	437197.896	372624.676	437197.896	Required	
S3	372632.424	437232.465	372632.424	437232.465	Required	
S5	372637.215	437254.893	372637.215	437254.893	Required	
4	372649.360	437309.876	372649.360	437309.876	Required	
S6 HYDROBRAKE	372646.973	437299.078	372646.973	437299.078	Required	
S7	372655.022	437297.300	372655.022	437297.300	Required	
S8	372663.744	437342.597	372663.744	437342.597	Required	
S9	372662.065	437337.111	372662.065	437337.111	Required	

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PIPELINE SCHEDULES for PARCEL B SW

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	1200	S2	61.279	57.734	2.345	Open Manhole	2700
1.001	o	1200	S3	61.670	57.645	2.825	Open Manhole	2700
1.002	o	1200	S5	61.506	57.588	2.718	Open Manhole	2700
2.000	o	1200	4	60.051	57.475	1.376	Open Manhole	2700
1.003	o	300	S6 HYDROBRAKE	60.462	57.447	2.715	Open Manhole	2700
1.004	o	300	S7	60.510	57.399	2.811	Open Manhole	1200
3.000	o	225	S8	58.683	57.258	1.200	Open Manhole	1200
1.005	o	300	S9	58.901	57.135	1.466	Open Manhole	1200
1.006	o	300	S10	59.145	56.676	2.169	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	35.427	398.1	S3	61.670	57.645	2.825	Open Manhole	2700
1.001	22.934	402.4	S5	61.506	57.588	2.718	Open Manhole	2700
1.002	45.250	320.9	S6 HYDROBRAKE	60.462	57.447	1.815	Open Manhole	2700
2.000	11.059	395.0	S6 HYDROBRAKE	60.462	57.447	1.815	Open Manhole	2700
1.003	8.243	171.7	S7	60.510	57.399	2.811	Open Manhole	1200
1.004	40.429	153.0	S9	58.901	57.135	1.466	Open Manhole	1200
3.000	5.738	120.0	S9	58.901	57.210	1.466	Open Manhole	1200
1.005	66.406	144.7	S10	59.145	56.676	2.169	Open Manhole	1200
1.006	2.580	130.0	EX MH5312	59.136	56.656	2.180	Open Manhole	225

Surcharged Outfall Details for PARCEL B SW

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006	EX MH5312	59.136	56.656	56.500	225	0

Datum (m) 0.000 Offset (mins) 0

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Surcharged Outfall Details for PARCEL B SW

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
5	1.000	15	1.000	25	1.000	35	1.000	45	1.000	55	1.000
10	1.000	20	1.000	30	1.000	40	1.000	50	1.000	60	1.000

Simulation Criteria for PARCEL B SW

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	4.000
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 Storage Structures	0
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.272		

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Online Controls for PARCEL B SW																																																																										
Hydro-Brake® Optimum Manhole: S6 HYDROBRAKE, DS/PN: 1.003, Volume (m³): 74.8																																																																										
Unit Reference MD-SHE-0124-1000-2500-1000 Design Head (m)2.500 Design Flow (l/s)10.0 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)124 Invert Level (m)57.447 Minimum Outlet Pipe Diameter (mm)150 Suggested Manhole Diameter (mm)1200																																																																										
Control Points Head (m)Flow (l/s) Design Point (Calculated)2.50010.0 Flush-Flo™0.5398.6 Kick-Flo®1.1076.8 Mean Flow over Head Range-8.0																																																																										
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																																																																										
<table><tr><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td></tr><tr><td>0.100</td><td>4.4</td><td>1.200</td><td>7.1</td><td>3.000</td><td>10.9</td><td>7.000</td><td>16.3</td></tr><tr><td>0.200</td><td>7.4</td><td>1.400</td><td>7.6</td><td>3.500</td><td>11.7</td><td>7.500</td><td>16.9</td></tr><tr><td>0.300</td><td>8.1</td><td>1.600</td><td>8.1</td><td>4.000</td><td>12.5</td><td>8.000</td><td>17.4</td></tr><tr><td>0.400</td><td>8.5</td><td>1.800</td><td>8.6</td><td>4.500</td><td>13.2</td><td>8.500</td><td>17.9</td></tr><tr><td>0.500</td><td>8.6</td><td>2.000</td><td>9.0</td><td>5.000</td><td>13.9</td><td>9.000</td><td>18.4</td></tr><tr><td>0.600</td><td>8.6</td><td>2.200</td><td>9.4</td><td>5.500</td><td>14.5</td><td>9.500</td><td>18.9</td></tr><tr><td>0.800</td><td>8.3</td><td>2.400</td><td>9.8</td><td>6.000</td><td>15.2</td><td></td><td></td></tr><tr><td>1.000</td><td>7.6</td><td>2.600</td><td>10.2</td><td>6.500</td><td>15.7</td><td></td><td></td></tr></table>			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	4.4	1.200	7.1	3.000	10.9	7.000	16.3	0.200	7.4	1.400	7.6	3.500	11.7	7.500	16.9	0.300	8.1	1.600	8.1	4.000	12.5	8.000	17.4	0.400	8.5	1.800	8.6	4.500	13.2	8.500	17.9	0.500	8.6	2.000	9.0	5.000	13.9	9.000	18.4	0.600	8.6	2.200	9.4	5.500	14.5	9.500	18.9	0.800	8.3	2.400	9.8	6.000	15.2			1.000	7.6	2.600	10.2	6.500	15.7		
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																			
0.100	4.4	1.200	7.1	3.000	10.9	7.000	16.3																																																																			
0.200	7.4	1.400	7.6	3.500	11.7	7.500	16.9																																																																			
0.300	8.1	1.600	8.1	4.000	12.5	8.000	17.4																																																																			
0.400	8.5	1.800	8.6	4.500	13.2	8.500	17.9																																																																			
0.500	8.6	2.000	9.0	5.000	13.9	9.000	18.4																																																																			
0.600	8.6	2.200	9.4	5.500	14.5	9.500	18.9																																																																			
0.800	8.3	2.400	9.8	6.000	15.2																																																																					
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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for PARCEL B SW

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 4.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 0

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.257

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.900 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status ON

Inertia Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Period(s) (years) 2, 30, 100

Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S2	120 Winter	2	+0%	100/60 Winter			
1.001	S3	120 Winter	2	+0%	100/60 Winter			
1.002	S5	120 Winter	2	+0%	100/60 Winter			
2.000	4	120 Winter	2	+0%	100/60 Summer			
1.003	S6 HYDROBRAKE	120 Winter	2	+0%	2/15 Summer			
1.004	S7	120 Winter	2	+0%				
3.000	S8	15 Summer	2	+0%				
1.005	S9	120 Winter	2	+0%				
1.006	S10	120 Winter	2	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S2	57.932	-1.002	0.000	0.01		11.3	OK
1.001	S3	57.932	-0.913	0.000	0.01		11.1	OK
1.002	S5	57.932	-0.856	0.000	0.01		14.9	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for PARCEL B SW

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.000		4 57.931	-0.744	0.000	0.00			1.2	OK
1.003	S6 HYDROBRAKE	57.931	0.184	0.000	0.14			8.6	SURCHARGED
1.004	S7	57.463	-0.236	0.000	0.10			8.6	OK
3.000	S8	57.258	-0.225	0.000	0.00			0.0	OK
1.005	S9	57.197	-0.238	0.000	0.10			8.6	OK
1.006	S10	56.757	-0.219	0.000	0.16			8.6	OK

PN	US/MH Name	Level Exceeded
1.000		S2
1.001		S3
1.002		S5
2.000		4
1.003	S6 HYDROBRAKE	
1.004		S7
3.000		S8
1.005		S9
1.006		S10

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for PARCEL B SW

Simulation Criteria

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

Synthetic Rainfall Details

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow
PN	Name	Storm		Period	Change	Surcharge	Flood	Overflow	Act.
1.000		S2	120	Winter	30	+0%	100/60	Winter	
1.001		S3	120	Winter	30	+0%	100/60	Winter	
1.002		S5	120	Winter	30	+0%	100/60	Winter	
2.000		4	120	Winter	30	+0%	100/60	Summer	
1.003	S6	HYDROBRAKE	120	Winter	30	+0%	2/15	Summer	
1.004		S7	960	Summer	30	+0%			
3.000		S8	15	Summer	30	+0%			
1.005		S9	960	Summer	30	+0%			
1.006		S10	960	Summer	30	+0%			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status
							Time (mins)	Flow (l/s)	
1.000	S2	58.281	-0.653	0.000	0.01			20.6	OK
1.001	S3	58.281	-0.564	0.000	0.01			15.3	OK
1.002	S5	58.281	-0.507	0.000	0.01			20.1	OK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for PARCEL B SW

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.000		4 60.003	1.328	0.000	0.00		1.6	FLOOD RISK
1.003	S6 HYDROBRAKE	60.003	2.256	0.000	0.16		10.0	SURCHARGED
1.004	S7	57.468	-0.231	0.000	0.12		10.0	OK
3.000	S8	57.258	-0.225	0.000	0.00		0.0	OK
1.005	S9	57.202	-0.233	0.000	0.11		10.0	OK
1.006	S10	56.764	-0.211	0.000	0.19		10.0	OK

PN	US/MH Name	Level Exceeded
1.000		S2
1.001		S3
1.002		S5
2.000		4
1.003	S6 HYDROBRAKE	
1.004		S7
3.000		S8
1.005		S9
1.006		S10