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Barton Arcade Manchester M3 2BH		
Date 24/05/2024 14:52 File 19310 - Redcued runoff r...	Designed by phill 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	18.580	0.111	167.4	0.144	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	36.068	0.147	245.4	0.087	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	35.623	0.253	140.8	0.140	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	26.998	0.180	150.0	0.043	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.000	25.358	0.079	321.0	0.099	5.00	0.0	0.600	o	375	Pipe/Conduit	
1.004	36.673	0.091	403.0	0.158	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.005	18.005	0.044	409.2	0.060	0.00	0.0	0.600	o	525	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	50.00	5.31	80.320	0.144	0.0	0.0	0.0	1.01	40.1	19.5
1.001	50.00	5.91	80.134	0.231	0.0	0.0	0.0	1.00	70.6	31.3
1.002	50.00	6.36	79.987	0.371	0.0	0.0	0.0	1.32	93.5	50.2
1.003	50.00	6.66	79.659	0.414	0.0	0.0	0.0	1.48	163.1	56.1
2.000	50.00	5.42	79.558	0.099	0.0	0.0	0.0	1.01	111.1	13.4
1.004	50.00	7.27	79.404	0.671	0.0	0.0	0.0	1.01	160.1	90.9
1.005	50.00	7.54	79.238	0.731	0.0	0.0	0.0	1.10	238.3	99.0

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Manhole Schedules for 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)
SW1	81.745	1.425	Open Manhole	1350	1.000	80.320	225		
SW2	81.819	1.685	Open Manhole	1350	1.001	80.134	300	1.000	80.209
SW3	81.712	1.725	Open Manhole	1350	1.002	79.987	300	1.001	79.987
SW4	81.234	1.575	Open Manhole	1350	1.003	79.659	375	1.002	79.734
SW15	80.809	1.251	Open Manhole	1500	2.000	79.558	375		
SW5	81.085	1.681	Open Manhole	1800	1.004	79.404	450	1.003	79.479
								2.000	79.479
SW6	81.222	1.984	Open Manhole	2100	1.005	79.238	525	1.004	79.313
SW16	80.628	1.276	Open Manhole	2100	3.000	79.352	450		
SW7	81.043	1.849	Open Manhole	2400	1.006	79.194	525	1.005	79.194
								3.000	79.268
SW8hwall	81.924	3.524	Open Manhole	2400	1.007	78.400	525	1.006	78.400
SW9hwall	81.924	3.624	Open Manhole	2400	1.008	78.300	750	1.007	78.300
S10 HYDROBRAKE	81.000	2.725	Open Manhole	2400	1.009	78.275	750	1.008	78.275
CUL1	81.000	1.639	Open Manhole	1800	4.000	79.361	600		
CUL2	81.200	1.950	Open Manhole	1800	4.001	79.250	600	4.000	79.250
CUL3	81.200	2.141	Open Manhole	1800	4.002	79.059	600	4.001	79.059
CUL4	81.250	2.254	Open Manhole	1800	4.003	78.996	600	4.002	78.996
SW17	80.500	2.170	Open Manhole	1800	4.004	78.330	750	4.003	78.947
SW11	80.800	2.560	Open Manhole	1800	1.010	78.240	750	1.009	78.240
								4.004	78.240
SW12	80.135	1.950	Open Manhole	1800	1.011	78.185	750	1.010	78.185
SW13	80.025	1.950	Open Manhole	1800	1.012	78.075	750	1.011	78.075
SW14	80.800	2.770	Open Manhole	1800		OUTFALL		1.012	78.030
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)			
SW1	374356.378	442588.682	374356.378	442588.682	Required				
SW2	374345.853	442573.371	374345.853	442573.371	Required				
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<u>Simulation Criteria for SW</u> Volumetric Runoff Coeff 0.750 Additional Flow - % of Total Flow 0.000 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 2.000 Hot Start (mins) 0 Inlet Coeffiecient 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 3 Number of Storage Structures 1 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> 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 0.300		
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Online Controls for SW Non Return Valve Manhole: SW7, DS/PN: 1.006, Volume (m³): 16.7 Hydro-Brake® Optimum Manhole: S10 HYDROBRAKE, DS/PN: 1.009, Volume (m³): 15.1 <table><tr><td>Unit Reference</td><td colspan="2">MD-SHE-0135-1090-2100-1090</td></tr><tr><td>Design Head (m)</td><td colspan="2">2.100</td></tr><tr><td>Design Flow (l/s)</td><td colspan="2">10.9</td></tr><tr><td>Flush-Flo™</td><td colspan="2">Calculated</td></tr><tr><td>Objective</td><td colspan="2">Minimise upstream storage</td></tr><tr><td>Application</td><td colspan="2">Surface</td></tr><tr><td>Sump Available</td><td colspan="2">Yes</td></tr><tr><td>Diameter (mm)</td><td colspan="2">135</td></tr><tr><td>Invert Level (m)</td><td colspan="2">78.275</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td colspan="2">150</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td colspan="2">1500</td></tr></table> <table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>2.100</td><td>10.9</td><td>Kick-Flo®</td><td>1.207</td><td>8.4</td></tr><tr><td>Flush-Flo™</td><td>0.591</td><td>10.6</td><td>Mean Flow over Head Range</td><td>-</td><td>9.4</td></tr></table> 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>4.9</td><td>1.200</td><td>8.5</td><td>3.000</td><td>12.9</td><td>7.000</td><td>19.3</td></tr><tr><td>0.200</td><td>8.8</td><td>1.400</td><td>9.0</td><td>3.500</td><td>13.9</td><td>7.500</td><td>20.0</td></tr><tr><td>0.300</td><td>9.8</td><td>1.600</td><td>9.6</td><td>4.000</td><td>14.8</td><td>8.000</td><td>20.6</td></tr><tr><td>0.400</td><td>10.3</td><td>1.800</td><td>10.1</td><td>4.500</td><td>15.6</td><td>8.500</td><td>21.2</td></tr><tr><td>0.500</td><td>10.5</td><td>2.000</td><td>10.6</td><td>5.000</td><td>16.4</td><td>9.000</td><td>21.8</td></tr><tr><td>0.600</td><td>10.6</td><td>2.200</td><td>11.1</td><td>5.500</td><td>17.2</td><td>9.500</td><td>22.4</td></tr><tr><td>0.800</td><td>10.4</td><td>2.400</td><td>11.6</td><td>6.000</td><td>17.9</td><td></td><td></td></tr><tr><td>1.000</td><td>9.8</td><td>2.600</td><td>12.0</td><td>6.500</td><td>18.6</td><td></td><td></td></tr></table> Non Return Valve Manhole: SW11, DS/PN: 1.010, Volume (m³): 28.4			Unit Reference	MD-SHE-0135-1090-2100-1090		Design Head (m)	2.100		Design Flow (l/s)	10.9		Flush-Flo™	Calculated		Objective	Minimise upstream storage		Application	Surface		Sump Available	Yes		Diameter (mm)	135		Invert Level (m)	78.275		Minimum Outlet Pipe Diameter (mm)	150		Suggested Manhole Diameter (mm)	1500		Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	2.100	10.9	Kick-Flo®	1.207	8.4	Flush-Flo™	0.591	10.6	Mean Flow over Head Range	-	9.4	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	4.9	1.200	8.5	3.000	12.9	7.000	19.3	0.200	8.8	1.400	9.0	3.500	13.9	7.500	20.0	0.300	9.8	1.600	9.6	4.000	14.8	8.000	20.6	0.400	10.3	1.800	10.1	4.500	15.6	8.500	21.2	0.500	10.5	2.000	10.6	5.000	16.4	9.000	21.8	0.600	10.6	2.200	11.1	5.500	17.2	9.500	22.4	0.800	10.4	2.400	11.6	6.000	17.9			1.000	9.8	2.600	12.0	6.500	18.6		
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Storage Structures for SW Tank or Pond Manhole: S10 HYDROBRAKE, DS/PN: 1.009 Invert Level (m) 78.300 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>113.7</td><td>2.000</td><td>493.6</td><td>2.010</td><td>0.0</td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	113.7	2.000	493.6	2.010	0.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)									
0.000	113.7	2.000	493.6	2.010	0.0									
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