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Merchant Exchange 17-19 Whitworth Street West Manchester, M1 5WG		
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STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

« - Indicates pipe capacity < flow

Network Results Table

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Network Design Table for Area B

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
4.003	5.044	0.050	100.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	5.299	0.034	155.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	7.427	0.048	154.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	7.280	0.047	154.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	14.215	0.091	156.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.000	21.941	0.485	45.2	0.117	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	36.276	0.380	95.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.007	40.562	0.390	104.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.008	15.999	0.110	145.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	16.976	0.020	848.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.010	33.146	0.220	150.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

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)
4.003	42.84	5.52	132.714	0.000	0.0	0.0	0.0	1.30	51.8	0.0
1.002	39.98	6.50	132.660	0.178	0.0	0.0	0.0	1.04	41.5	20.8
1.003	39.67	6.62	132.626	0.178	0.0	0.0	0.0	1.05	41.7	20.8
1.004	39.37	6.74	132.578	0.178	0.0	0.0	0.0	1.05	41.7	20.8
1.005	38.79	6.96	132.531	0.178	0.0	0.0	0.0	1.04	41.5	20.8
5.000	43.73	5.24	133.000	0.117	0.0	0.0	0.0	1.50	26.5	13.9
1.006	37.71	7.42	132.440	0.295	0.0	0.0	0.0	1.34	53.2	30.1
1.007	36.53	7.94	132.060	0.295	0.0	0.0	0.0	1.28	51.0	30.1
1.008	36.02	8.19	131.670	0.295	0.0	0.0	0.0	1.08	43.0	30.1
1.009	34.74	8.83	131.560	0.295	0.0	0.0	0.0	0.44	17.5	30.1
1.010	33.79	9.35	131.540	0.295	0.0	0.0	0.0	1.06	42.3	30.1

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Manhole Schedules for Area B

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)	Backdrop (mm)
BCW128	134.870	1.290	Open Manhole	1200	1.000	133.580	150				
BSW25	134.860	1.470	Open Manhole	1200	2.000	133.390	150				
BCW127	134.570	1.270	Open Manhole	1200	1.001	133.300	150	1.000	133.300	150	
								2.000	133.300	150	
BFW10	134.370	1.370	Open Manhole	1200	3.000	133.000	225				
BFW126	134.220	1.150	Open Manhole	1200	4.000	133.070	225				
BNODE04	134.240	1.316	Junction		4.001	132.924	225	4.000	132.924	225	
BNODE05	134.250	1.380	Junction		4.002	132.870	225	4.001	132.870	225	
BNODE06	134.270	1.556	Junction		4.003	132.714	225	4.002	132.714	225	
BCW109	134.240	1.580	Open Manhole	1200	1.002	132.660	225	1.001	132.735	150	
								3.000	132.660	225	
								4.003	132.664	225	
BNODE07	134.300	1.674	Junction		1.003	132.626	225	1.002	132.626	225	
BNODE08	134.300	1.722	Junction		1.004	132.578	225	1.003	132.578	225	
BNODE09	134.320	1.789	Junction		1.005	132.531	225	1.004	132.531	225	
BFW108A	134.320	1.320	Open Manhole	1200	5.000	133.000	150				
BCW108	134.190	1.750	Open Manhole	1200	1.006	132.440	225	1.005	132.440	225	
								5.000	132.515	150	
BCW106	134.010	1.950	Open Manhole	1200	1.007	132.060	225	1.006	132.060	225	
BCW105	134.480	2.810	Open Manhole	1200	1.008	131.670	225	1.007	131.670	225	
BCW104	134.510	2.950	Open Manhole	1200	1.009	131.560	225	1.008	131.560	225	
BCW103	134.450	2.910	Open Manhole	1200	1.010	131.540	225	1.009	131.540	225	
BEDS14	135.070	3.750	Open Manhole	1200		OUTFALL		1.010	131.320	225	

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Area Summary for Area B

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.000	0.000	0.000
1.001	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.178	0.178	0.178
4.000	-	-	100	0.000	0.000	0.000
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
4.003	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.117	0.117	0.117
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.295	0.295	0.295

Simulation Criteria for Area B

Volumetric Runoff Coeff	0.750	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 Storage Structures	0
Number of Online Controls	0	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)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.294		

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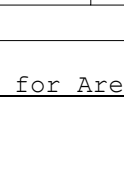
Surcharged Outfall Details for Area B

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.010	BEDS14	135.070	131.320	131.320	1200	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
60	131.083	300	131.083	540	131.083	780	131.083	1020	131.083	1260	131.083
120	131.083	360	131.083	600	131.083	840	131.083	1080	131.083	1320	131.083
180	131.083	420	131.083	660	131.083	900	131.083	1140	131.083	1380	131.083
240	131.083	480	131.083	720	131.083	960	131.083	1200	131.083	1440	131.083

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Summary of Critical Results by Maximum Outflow (Rank 1) for Area B

Simulation Criteria

Areal Reduction Factor 1.000	Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0	MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0	Inlet Coeffiecient 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 Offline Controls 0
 Number of Time/Area Diagrams 0
 Number of Online Controls 0
 Number of Storage Structures 0
 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R 0.294
Region England and Wales Cv (Summer)	0.750	
M5-60 (mm)	19.000 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, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1
 Climate Change (%) 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	BCW128	60 Winter	1	+0%					133.580
2.000	BSW25	60 Winter	1	+0%					133.390
1.001	BCW127	60 Winter	1	+0%					133.300
3.000	BFW10	15 Winter	1	+0%					133.104
4.000	BFW126	60 Winter	1	+0%					133.070
4.001	BNODE04	60 Winter	1	+0%					132.924
4.002	BNODE05	60 Winter	1	+0%					132.870
4.003	BNODE06	15 Summer	1	+0%					132.793
1.002	BCW109	15 Winter	1	+0%					132.797
1.003	BNODE07	15 Winter	1	+0%					132.761
1.004	BNODE08	15 Winter	1	+0%					132.713
1.005	BNODE09	15 Winter	1	+0%					132.643
5.000	BFW108A	15 Winter	1	+0%					133.081
1.006	BCW108	15 Winter	1	+0%					132.573
1.007	BCW106	15 Winter	1	+0%					132.195
1.008	BCW105	15 Winter	1	+0%	1/15 Summer				131.921

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Summary of Critical Results by Maximum Outflow (Rank 1) for Area B

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)			
1.000	BCW128	-0.150	0.000	0.00		0.0	OK	
2.000	BSW25	-0.150	0.000	0.00		0.0	OK	
1.001	BCW127	-0.150	0.000	0.00		0.0	OK	
3.000	BFW10	-0.121	0.000	0.43		20.9	OK	
4.000	BFW126	-0.225	0.000	0.00		0.0	OK	
4.001	BNODE04	-0.225	0.000	0.00		0.0	OK*	
4.002	BNODE05	-0.225	0.000	0.00		0.0	OK*	
4.003	BNODE06	-0.146	0.000	0.02		0.7	OK*	
1.002	BCW109	-0.088	0.000	0.68		20.3	OK	
1.003	BNODE07	-0.090	0.000	0.66		20.4	OK*	
1.004	BNODE08	-0.090	0.000	0.67		20.5	OK*	
1.005	BNODE09	-0.113	0.000	0.49		20.3	OK*	
5.000	BFW108A	-0.069	0.000	0.55		13.9	OK	
1.006	BCW108	-0.092	0.000	0.64		32.4	OK	
1.007	BCW106	-0.090	0.000	0.66		31.9	OK	
1.008	BCW105	0.026	0.000	0.80		30.4	SURCHARGED	

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Summary of Critical Results by Maximum Outflow (Rank 1) for Area B

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.294
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	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, 240, 360, 480, 960, 1440
Return Period(s) (years)	30
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	BCW128	960 Summer	30	+0%	30/120 Summer			
2.000	BSW25	960 Summer	30	+0%	30/120 Summer			
1.001	BCW127	960 Winter	30	+0%	30/120 Summer			
3.000	BFW10	15 Winter	30	+0%	30/15 Summer			
4.000	BFW126	1440 Summer	30	+0%	30/120 Summer			
4.001	BNODE04	1440 Summer	30	+0%				
4.002	BNODE05	960 Winter	30	+0%				
4.003	BNODE06	1440 Winter	30	+0%				
1.002	BCW109	15 Winter	30	+0%	30/15 Summer			
1.003	BNODE07	1440 Winter	30	+0%				
1.004	BNODE08	960 Winter	30	+0%				
1.005	BNODE09	1440 Summer	30	+0%				
5.000	BFW108A	15 Winter	30	+0%	30/15 Summer			
1.006	BCW108	15 Winter	30	+0%	30/15 Summer			
1.007	BCW106	1440 Winter	30	+0%	30/15 Summer	30/120 Summer		
1.008	BCW105	1440 Winter	30	+0%	30/15 Summer			

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Summary of Critical Results by Maximum Outflow (Rank 1) for Area B

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	BCW128	134.119	0.389	0.000	0.12		2.3	SURCHARGED	
2.000	BSW25	134.119	0.579	0.000	0.13		2.3	SURCHARGED	
1.001	BCW127	134.138	0.688	0.000	0.48		7.9	SURCHARGED	
3.000	BFW10	133.363	0.138	0.000	0.95		46.5	SURCHARGED	
4.000	BFW126	134.136	0.841	0.000	0.08		3.7	FLOOD RISK	
4.001	BNODE04	133.149	0.000	0.000	0.21		7.0	SURCHARGED*	
4.002	BNODE05	133.095	0.000	0.000	0.18		9.4	SURCHARGED*	
4.003	BNODE06	132.939	0.000	0.000	0.37		11.7	SURCHARGED*	
1.002	BCW109	133.186	0.301	0.000	1.18		35.2	SURCHARGED	
1.003	BNODE07	132.851	0.000	0.000	1.08		33.4	SURCHARGED*	
1.004	BNODE08	132.803	0.000	0.000	1.15		35.1	SURCHARGED*	
1.005	BNODE09	132.756	0.000	0.000	0.89		36.8	SURCHARGED*	
5.000	BFW108A	133.443	0.293	0.000	1.15		28.8	SURCHARGED	
1.006	BCW108	132.891	0.226	0.000	1.04		52.1	SURCHARGED	
1.007	BCW106	134.155	1.870	144.830	1.68		81.5	FLOOD	12
1.008	BCW105	134.182	2.287	0.000	2.05		78.1	FLOOD RISK	

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Surcharged Outfall Details for Area B

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.010	BEDS14	135.070	131.320	131.320	1200	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
60	134.447	300	134.447	540	134.447	780	134.447	1020	134.447	1260	134.447
120	134.447	360	134.447	600	134.447	840	134.447	1080	134.447	1320	134.447
180	134.447	420	134.447	660	134.447	900	134.447	1140	134.447	1380	134.447
240	134.447	480	134.447	720	134.447	960	134.447	1200	134.447	1440	134.447

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Summary of Critical Results by Maximum Outflow (Rank 1) for Area B

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.294
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	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, 240, 360, 480, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	BCW128	1440 Winter	100	+0%	100/120 Summer			
2.000	BSW25	1440 Winter	100	+0%	100/120 Summer			
1.001	BCW127	960 Summer	100	+0%	100/15 Winter			
3.000	BFW10	15 Winter	100	+0%	100/15 Summer			
4.000	BFW126	960 Winter	100	+0%	100/15 Summer	100/240 Summer		
4.001	BNODE04	15 Winter	100	+0%				
4.002	BNODE05	15 Winter	100	+0%				
4.003	BNODE06	15 Winter	100	+0%				
1.002	BCW109	15 Winter	100	+0%	100/15 Summer	100/240 Summer		
1.003	BNODE07	960 Summer	100	+0%				
1.004	BNODE08	960 Summer	100	+0%				
1.005	BNODE09	960 Winter	100	+0%				
5.000	BFW108A	15 Winter	100	+0%	100/15 Summer			
1.006	BCW108	15 Winter	100	+0%	100/15 Summer	100/1440 Winter		
1.007	BCW106	1440 Winter	100	+0%	100/15 Summer	100/120 Summer		
1.008	BCW105	1440 Winter	100	+0%	100/15 Summer			

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Merchant Exchange 17-19 Whitworth Street West Manchester, M1 5WG		
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Innovyze	Network 2018.1.1	

Summary of Critical Results by Maximum Outflow (Rank 1) for Area B

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	BCW128	134.198	0.468	0.000	0.12		2.3	SURCHARGED	
2.000	BSW25	134.198	0.658	0.000	0.13		2.3	SURCHARGED	
1.001	BCW127	134.160	0.710	0.000	0.48		7.9	SURCHARGED	
3.000	BFW10	133.715	0.490	0.000	1.13		55.2	SURCHARGED	
4.000	BFW126	134.183	0.888	0.000	0.08		3.6	FLOOD RISK	1
4.001	BNODE04	133.149	0.000	0.000	0.22		7.2	SURCHARGED*	
4.002	BNODE05	133.095	0.000	0.000	0.18		9.6	SURCHARGED*	
4.003	BNODE06	132.939	0.000	0.000	0.39		12.2	SURCHARGED*	
1.002	BCW109	133.506	0.621	0.000	1.21		36.1	SURCHARGED	1
1.003	BNODE07	132.851	0.000	0.000	1.08		33.4	SURCHARGED*	
1.004	BNODE08	132.803	0.000	0.000	1.15		35.1	SURCHARGED*	
1.005	BNODE09	132.756	0.000	0.000	0.89		36.8	SURCHARGED*	
5.000	BFW108A	133.898	0.748	0.000	1.34		33.5	SURCHARGED	
1.006	BCW108	133.200	0.535	0.000	1.14		57.4	SURCHARGED	1
1.007	BCW106	134.197	1.912	186.802	1.71		82.7	FLOOD	12
1.008	BCW105	134.287	2.392	0.000	2.07		78.9	FLOOD RISK	

