Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.177	4-8	0.038

Total Area Contributing (ha) = 0.215

Total Pipe Volume (m³) = 2.265

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Existing Network Details for Storm

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
1.000	4.700	0.034	138.2	0.039	5.00	0.0	0.600	o	225	Pipe/Conduit
1.001	2.500	0.016	156.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.002	1.670	0.011	151.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.003	1.260	0.011	114.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
2.000	5.250	0.074	70.9	0.025	5.00	0.0	0.600	o	225	Pipe/Conduit
2.001	12.400	0.151	82.1	0.054	5.00	0.0	0.600	o	225	Pipe/Conduit
3.000	3.220	0.020	161.0	0.008	5.00	0.0	0.600	o	225	Pipe/Conduit
3.001	1.000	0.005	200.0	0.054	5.00	0.0	0.600	o	225	Pipe/Conduit
4.000	10.000	0.100	100.0	0.035	5.00	0.0	0.600	o	150	Pipe/Conduit
1.004	1.000	0.010	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.005	5.300	0.040	132.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.006	14.230	0.220	64.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	1.355	0.039	0.0	1.11	44.1
1.001	1.321	0.039	0.0	1.04	41.5
1.002	1.305	0.039	0.0	1.06	42.1
1.003	1.294	0.039	0.0	1.22	48.5
2.000	2.035	0.025	0.0	1.55	61.8
2.001	1.961	0.079	0.0	1.44	57.4
3.000	2.005	0.008	0.0	1.03	40.9
3.001	1.985	0.062	0.0	0.92	36.6
4.000	1.420	0.035	0.0	1.00	17.8
1.004	1.260	0.215	0.0	1.31	52.0
1.005	1.250	0.215	0.0	1.13	45.1
1.006	1.210	0.215	0.0	1.63	64.8

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SP2	2.230	0.875	Open Manhole	1200	1.000	1.355	225				
MH S102	2.410	1.089	Open Manhole	1200	1.001	1.321	225	1.000	1.321	225	
PI	2.530	1.225	Open Manhole	1800	1.002	1.305	225	1.001	1.305	225	
MH S103	2.650	1.356	Open Manhole	1200	1.003	1.294	225	1.002	1.294	225	
SP1	2.910	0.875	Open Manhole	1200	2.000	2.035	225				
MH S101	3.015	1.054	Open Manhole	1200	2.001	1.961	225	2.000	1.961	225	
SP3	2.880	0.875	Open Manhole	1200	3.000	2.005	225				
MH S104	3.100	1.115	Open Manhole	1200	3.001	1.985	225	3.000	1.985	225	
MH S100	2.230	0.810	Open Manhole	450	4.000	1.420	150				
TANK	2.532	1.272	Open Manhole	1200	1.004	1.260	225	1.003	1.283	225	23
								2.001	1.810	225	550
								3.001	1.980	225	720
								4.000	1.320	150	
MH S105	2.488	1.238	Open Manhole	1200	1.005	1.250	225	1.004	1.250	225	
EX MH S4	2.210	1.000	Open Manhole	1200	1.006	1.210	225	1.005	1.210	225	
MH S10	2.090	1.100	Open Manhole	0		OUTFALL		1.006	0.990	225	

No coordinates have been specified, layout information cannot be produced.

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PIPELINE SCHEDULES for Storm

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	225	SP2	2.230	1.355	0.650	Open Manhole	1200
1.001	o	225	MH S102	2.410	1.321	0.864	Open Manhole	1200
1.002	o	225	PI	2.530	1.305	1.000	Open Manhole	1800
1.003	o	225	MH S103	2.650	1.294	1.131	Open Manhole	1200
2.000	o	225	SP1	2.910	2.035	0.650	Open Manhole	1200
2.001	o	225	MH S101	3.015	1.961	0.829	Open Manhole	1200
3.000	o	225	SP3	2.880	2.005	0.650	Open Manhole	1200
3.001	o	225	MH S104	3.100	1.985	0.890	Open Manhole	1200
4.000	o	150	MH S100	2.230	1.420	0.660	Open Manhole	450
1.004	o	225	TANK	2.532	1.260	1.047	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	4.700	138.2	MH S102	2.410	1.321	0.864	Open Manhole	1200
1.001	2.500	156.3	PI	2.530	1.305	1.000	Open Manhole	1800
1.002	1.670	151.8	MH S103	2.650	1.294	1.131	Open Manhole	1200
1.003	1.260	114.5	TANK	2.532	1.283	1.024	Open Manhole	1200
2.000	5.250	70.9	MH S101	3.015	1.961	0.829	Open Manhole	1200
2.001	12.400	82.1	TANK	2.532	1.810	0.497	Open Manhole	1200
3.000	3.220	161.0	MH S104	3.100	1.985	0.890	Open Manhole	1200
3.001	1.000	200.0	TANK	2.532	1.980	0.327	Open Manhole	1200
4.000	10.000	100.0	TANK	2.532	1.320	1.062	Open Manhole	1200
1.004	1.000	100.0	MH S105	2.488	1.250	1.013	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

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)
1.005	o	225	MH S105	2.488	1.250	1.013	Open Manhole	1200
1.006	o	225	EX MH S4	2.210	1.210	0.775	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)
1.005	5.300	132.5	EX MH S4	2.210	1.210	0.775	Open Manhole	1200
1.006	14.230	64.7	MH S10	2.090	0.990	0.875	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006	MH S10	2.090	0.990	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	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 2	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	FEH Rainfall Version	2013
Data Type	Point		
Return Period (years)	100	Site Location GB 517185 103962 TQ 17185 03962	
Summer Storms	Yes		

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Synthetic Rainfall Details

Winter Storms	No	Cv (Winter)	0.840
Cv (Summer)	0.750	Storm Duration (mins)	30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: MH S105, DS/PN: 1.005, Volume (m³): 1.4

Unit Reference	MD-SHE-0068-2000-0960-2000	Sump Available	Yes
Design Head (m)	0.960	Diameter (mm)	68
Design Flow (l/s)	2.0	Invert Level (m)	1.250
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.960	2.0	Kick-Flo®	0.598	1.6
Flush-Flo™	0.294	2.0	Mean Flow over Head Range	-	1.8

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.7	0.600	1.6	1.600	2.5	2.600	3.2	5.000	4.3	7.500	5.2
0.200	1.9	0.800	1.8	1.800	2.7	3.000	3.4	5.500	4.5	8.000	5.3
0.300	2.0	1.000	2.0	2.000	2.8	3.500	3.6	6.000	4.7	8.500	5.5
0.400	2.0	1.200	2.2	2.200	2.9	4.000	3.9	6.500	4.8	9.000	5.6
0.500	1.9	1.400	2.4	2.400	3.0	4.500	4.1	7.000	5.0	9.500	5.8

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Storage Structures for Storm

Porous Car Park Manhole: MH S100, DS/PN: 4.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	27.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	1.670	Depression Storage (mm)	5
Max Percolation (l/s)	71.0	Width (m)	12.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	21.3	Cap Volume Depth (m)	0.460

Complex Manhole: TANK, DS/PN: 1.004

Cellular Storage

Invert Level (m)	1.260	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	132.0	132.0	0.800	132.0	168.8	0.801	0.0	168.8

Cellular Storage

Invert Level (m)	1.260	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	66.0	66.0	0.400	66.0	79.0	0.401	0.0	79.0

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 517185 103962 TQ 17185 03962 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SP2	240 Winter	2	+0%	30/120 Winter				1.431	-0.149	0.000	0.05			1.6	OK	
1.001	MH S102	240 Winter	2	+0%	30/60 Winter				1.431	-0.115	0.000	0.06			1.6	OK	
1.002	PI	240 Winter	2	+0%	30/60 Winter				1.431	-0.099	0.000	0.05			1.5	OK	
1.003	MH S103	240 Winter	2	+0%	30/60 Summer				1.431	-0.088	0.000	0.05			1.4	OK	
2.000	SP1	15 Winter	2	+0%					2.085	-0.175	0.000	0.11			4.2	OK	
2.001	MH S101	15 Winter	2	+0%	100/15 Winter				2.041	-0.145	0.000	0.27			13.2	OK	
3.000	SP3	15 Winter	2	+0%	100/15 Summer				2.078	-0.152	0.000	0.05			1.4	OK	
3.001	MH S104	15 Winter	2	+0%	100/15 Summer				2.077	-0.133	0.000	0.34			10.3	OK	
4.000	MH S100	15 Winter	2	+0%	30/120 Summer				1.486	-0.084	0.000	0.37		6	5.8	OK	
1.004	TANK	240 Winter	2	+0%	30/30 Winter				1.431	-0.054	0.000	0.08		202	2.5	OK	
1.005	MH S105	360 Winter	2	+0%	30/30 Summer				1.449	-0.026	0.000	0.06			1.9	OK	
1.006	EX MH S4	240 Winter	2	+0%					1.237	-0.198	0.000	0.03			1.9	OK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 517185 103962 TQ 17185 03962 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SP2	240 Winter	30	+0%	30/120 Winter				1.646	0.066	0.000	0.10			2.9	SURCHARGED	
1.001	MH S102	240 Winter	30	+0%	30/60 Winter				1.646	0.100	0.000	0.10			2.8	SURCHARGED	
1.002	PI	240 Winter	30	+0%	30/60 Winter				1.646	0.116	0.000	0.09			2.6	SURCHARGED	
1.003	MH S103	240 Winter	30	+0%	30/60 Summer				1.646	0.127	0.000	0.08			2.5	SURCHARGED	
2.000	SP1	15 Winter	30	+0%					2.112	-0.148	0.000	0.25			9.6	OK	
2.001	MH S101	15 Winter	30	+0%	100/15 Winter				2.090	-0.096	0.000	0.61			30.2	OK	
3.000	SP3	15 Winter	30	+0%	100/15 Summer				2.141	-0.089	0.000	0.12			3.1	OK	
3.001	MH S104	15 Winter	30	+0%	100/15 Summer				2.139	-0.071	0.000	0.79			23.5	OK	
4.000	MH S100	240 Winter	30	+0%	30/120 Summer				1.647	0.077	0.000	0.17		191	2.7	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.004	TANK	240 Winter	30	+0%	30/30 Winter				1.646	0.161	0.000	0.16			4.9	SURCHARGED	
1.005	MH S105	240 Winter	30	+0%	30/30 Summer				1.698	0.223	0.000	0.07			2.0	SURCHARGED	
1.006	EX MH S4	60 Winter	30	+0%					1.237	-0.198	0.000	0.04			2.0	OK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 517185 103962 TQ 17185 03962 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SP2	360 Winter	100	+40%	30/120 Winter				2.225	0.645	0.000	0.13			3.7	FLOOD RISK	
1.001	MH S102	360 Winter	100	+40%	30/60 Winter				2.230	0.684	0.000	0.13			3.6	FLOOD RISK	
1.002	PI	360 Winter	100	+40%	30/60 Winter				2.234	0.704	0.000	0.11			3.4	FLOOD RISK	
1.003	MH S103	360 Winter	100	+40%	30/60 Summer				2.237	0.718	0.000	0.11			3.3	SURCHARGED	
2.000	SP1	360 Winter	100	+40%					2.230	-0.030	0.000	0.07			2.5	OK	
2.001	MH S101	360 Winter	100	+40%	100/15 Winter				2.234	0.048	0.000	0.16			8.0	SURCHARGED	
3.000	SP3	15 Winter	100	+40%	100/15 Summer				2.291	0.061	0.000	0.21			5.5	SURCHARGED	
3.001	MH S104	15 Winter	100	+40%	100/15 Summer				2.288	0.078	0.000	1.40			41.9	SURCHARGED	
4.000	MH S100	360 Winter	100	+40%	30/120 Summer				2.225	0.655	0.000	0.22		105	3.4	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.004	TANK	360 Winter	100	+40%	30/30 Winter				2.241	0.756	0.000	0.11			3.4	FLOOD RISK	
1.005	MH S105	360 Winter	100	+40%	30/30 Summer				2.255	0.780	0.000	0.07			2.0	FLOOD RISK	
1.006	EX MH S4	360 Winter	100	+40%					1.237	-0.198	0.000	0.04			2.0	OK	

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