

RCD		Page 1																																																																																																																																										
9 Birchtree Way Maidstone Kent ME15 7RP	THE BUILDERS YARD LOWER RANGE ROAD GRAVESEND																																																																																																																																											
Date 23/08/2022 12:35 File 1190-2202-B.MDX	Designed by RAC Checked by																																																																																																																																											
Micro Drainage	Network 2020.1.3																																																																																																																																											
<u>STORM SEWER DESIGN by the Modified Rational Method</u> <u>Design Criteria for Storm</u> Pipe Sizes STANDARD Manhole Sizes STANDARD FSR Rainfall Model - England and Wales <table><tr><td>Return Period (years)</td><td>1</td><td>PIMP (%)</td><td>100</td></tr><tr><td>M5-60 (mm)</td><td>26.250</td><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>Ratio R</td><td>0.350</td><td>Minimum Backdrop Height (m)</td><td>0.000</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>0</td><td>Maximum Backdrop Height (m)</td><td>10.000</td></tr><tr><td>Maximum Time of Concentration (mins)</td><td>30</td><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Foul Sewage (l/s/ha)</td><td>0.000</td><td>Min Vel for Auto Design only (m/s)</td><td>1.00</td></tr><tr><td>Volumetric Runoff Coeff.</td><td>0.750</td><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr></table> Designed with Level Soffits <u>Time Area Diagram for Storm</u> <table><tr><td>Time (mins)</td><td>Area (ha)</td><td>Time (mins)</td><td>Area (ha)</td></tr><tr><td>0-4</td><td>0.071</td><td>4-8</td><td>0.013</td></tr></table> Total Area Contributing (ha) = 0.084 Total Pipe Volume (m³) = 6.432			Return Period (years)	1	PIMP (%)	100	M5-60 (mm)	26.250	Add Flow / Climate Change (%)	0	Ratio R	0.350	Minimum Backdrop Height (m)	0.000	Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	10.000	Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200	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	Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.071	4-8	0.013																																																																																																						
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9 Birchtree Way
Maidstone
Kent ME15 7RP

THE BUILDERS YARD
LOWER RANGE ROAD
GRAVESEND

Date 23/08/2022 12:35
File 1190-2202-B.MDX

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Network Design Table 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	Auto Design
1.002	6.000	0.050	120.0	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)	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)
1.002	0.00	5.74	2.950	0.084	0.0	0.0	0.0	1.43	101.4	0.0

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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 Invert Level (m)	Diameter (mm)	Pipes In PN Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	4.000	0.800	Open Manhole	600	1.000	3.200	300		
2	4.000	0.950	Open Manhole	600	1.001	3.050	300	1.000	3.050
re	4.000	0.750	Open Manhole	600	2.000	3.250	300		
3	4.000	0.850	Open Manhole	600	2.001	3.150	300	2.000	3.150
4	4.000	0.900	Open Manhole	600	2.002	3.100	300	2.001	3.100
5	4.000	1.050	Open Manhole	1200	1.002	2.950	300	1.001	2.950
								2.002	3.050
ex	4.000	1.100	Open Manhole	1200		OUTFALL		1.002	2.900

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	300	1	4.000	3.200	0.500	Open Manhole	600
1.001	o	300	2	4.000	3.050	0.650	Open Manhole	600
2.000	o	300	re	4.000	3.250	0.450	Open Manhole	600
2.001	o	300	3	4.000	3.150	0.550	Open Manhole	600
2.002	o	300	4	4.000	3.100	0.600	Open Manhole	600
1.002	o	300	5	4.000	2.950	0.750	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	31.000	206.7	2	4.000	3.050	0.650	Open Manhole	600
1.001	15.000	150.0	5	4.000	2.950	0.750	Open Manhole	1200
2.000	21.000	210.0	3	4.000	3.150	0.550	Open Manhole	600
2.001	11.000	220.0	4	4.000	3.100	0.600	Open Manhole	600
2.002	7.000	140.0	5	4.000	3.050	0.650	Open Manhole	1200
1.002	6.000	120.0	ex	4.000	2.900	0.800	Open Manhole	1200

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)
1.002	ex	4.000	2.900	2.900	1200	0

Simulation Criteria for Storm

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 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 1

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

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<u>Online Controls for Storm</u> <u>Orifice Manhole: 5, DS/PN: 1.002, Volume (m³): 2.6</u> Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 2.950		
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<u>Storage Structures for Storm</u> <u>Porous Car Park Manhole: 4, DS/PN: 2.002</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>10.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>44.0</td></tr><tr><td>Max Percolation (l/s)</td><td>122.2</td><td>Slope (1:X)</td><td>0.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>3.550</td><td>Membrane Depth (mm)</td><td>0</td></tr></table> <u>Volume Summary (Static)</u> Length Calculations based on Centre-Centre <table><thead><tr><th>Pipe Number</th><th>USMH Name</th><th>Manhole Volume (m³)</th><th>Pipe Volume (m³)</th><th>Storage Structure Volume (m³)</th><th>Total Volume (m³)</th></tr></thead><tbody><tr><td>1.000</td><td>1</td><td>0.226</td><td>2.191</td><td>0.000</td><td>2.417</td></tr><tr><td>1.001</td><td>2</td><td>0.269</td><td>1.060</td><td>0.000</td><td>1.329</td></tr><tr><td>2.000</td><td>re</td><td>0.212</td><td>1.484</td><td>0.000</td><td>1.696</td></tr><tr><td>2.001</td><td>3</td><td>0.240</td><td>0.778</td><td>0.000</td><td>1.018</td></tr><tr><td>2.002</td><td>4</td><td>0.254</td><td>0.495</td><td>59.400</td><td>60.149</td></tr><tr><td>1.002</td><td>5</td><td>1.188</td><td>0.424</td><td>0.000</td><td>1.612</td></tr><tr><td colspan="2">Total</td><td>2.389</td><td>6.432</td><td>59.400</td><td>68.222</td></tr></tbody></table> <u>Volume Summary (Static)</u> Length Calculations based on True Length <table><thead><tr><th>Pipe Number</th><th>USMH Name</th><th>Manhole Volume (m³)</th><th>Pipe Volume (m³)</th><th>Storage Structure Volume (m³)</th><th>Total Volume (m³)</th></tr></thead><tbody><tr><td>1.000</td><td>1</td><td>0.226</td><td>2.149</td><td>0.000</td><td>2.375</td></tr><tr><td>1.001</td><td>2</td><td>0.269</td><td>0.997</td><td>0.000</td><td>1.265</td></tr><tr><td>2.000</td><td>re</td><td>0.212</td><td>1.442</td><td>0.000</td><td>1.654</td></tr><tr><td>2.001</td><td>3</td><td>0.240</td><td>0.735</td><td>0.000</td><td>0.975</td></tr><tr><td>2.002</td><td>4</td><td>0.254</td><td>0.431</td><td>59.400</td><td>60.086</td></tr><tr><td>1.002</td><td>5</td><td>1.188</td><td>0.339</td><td>0.000</td><td>1.527</td></tr><tr><td colspan="2">Total</td><td>2.389</td><td>6.093</td><td>59.400</td><td>67.882</td></tr></tbody></table>						Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	44.0	Max Percolation (l/s)	122.2	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	3.550	Membrane Depth (mm)	0	Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)	1.000	1	0.226	2.191	0.000	2.417	1.001	2	0.269	1.060	0.000	1.329	2.000	re	0.212	1.484	0.000	1.696	2.001	3	0.240	0.778	0.000	1.018	2.002	4	0.254	0.495	59.400	60.149	1.002	5	1.188	0.424	0.000	1.612	Total		2.389	6.432	59.400	68.222	Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)	1.000	1	0.226	2.149	0.000	2.375	1.001	2	0.269	0.997	0.000	1.265	2.000	re	0.212	1.442	0.000	1.654	2.001	3	0.240	0.735	0.000	0.975	2.002	4	0.254	0.431	59.400	60.086	1.002	5	1.188	0.339	0.000	1.527	Total		2.389	6.093	59.400	67.882
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0																																																																																																																										
Membrane Percolation (mm/hr)	1000	Length (m)	44.0																																																																																																																										
Max Percolation (l/s)	122.2	Slope (1:X)	0.0																																																																																																																										
Safety Factor	2.0	Depression Storage (mm)	5																																																																																																																										
Porosity	0.30	Evaporation (mm/day)	3																																																																																																																										
Invert Level (m)	3.550	Membrane Depth (mm)	0																																																																																																																										
Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)																																																																																																																								
1.000	1	0.226	2.191	0.000	2.417																																																																																																																								
1.001	2	0.269	1.060	0.000	1.329																																																																																																																								
2.000	re	0.212	1.484	0.000	1.696																																																																																																																								
2.001	3	0.240	0.778	0.000	1.018																																																																																																																								
2.002	4	0.254	0.495	59.400	60.149																																																																																																																								
1.002	5	1.188	0.424	0.000	1.612																																																																																																																								
Total		2.389	6.432	59.400	68.222																																																																																																																								
Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)																																																																																																																								
1.000	1	0.226	2.149	0.000	2.375																																																																																																																								
1.001	2	0.269	0.997	0.000	1.265																																																																																																																								
2.000	re	0.212	1.442	0.000	1.654																																																																																																																								
2.001	3	0.240	0.735	0.000	0.975																																																																																																																								
2.002	4	0.254	0.431	59.400	60.086																																																																																																																								
1.002	5	1.188	0.339	0.000	1.527																																																																																																																								
Total		2.389	6.093	59.400	67.882																																																																																																																								
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9 Birchtree Way Maidstone Kent ME15 7RP	THE BUILDERS YARD LOWER RANGE ROAD GRAVESEND																																																																																										
Date 23/08/2022 12:35 File 1190-2202-B.MDX	Designed by RAC Checked by																																																																																										
Micro Drainage	Network 2020.1.3																																																																																										
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>																																																																																											
<u>Simulation Criteria</u>																																																																																											
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 Storage Structures 1 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0																																																																																											
<u>Synthetic Rainfall Details</u>																																																																																											
Rainfall Model FSR Ratio R 0.350 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 26.250 Cv (Winter) 0.840																																																																																											
Margin for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status ON 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080 Return Period(s) (years) 100 Climate Change (%) 20																																																																																											
WARNING: Half Drain Time has not been calculated as the structure is too full.																																																																																											
<table><tr><th colspan="2">US/MH</th><th rowspan="2">Return</th><th rowspan="2">Climate</th><th rowspan="2">First (X)</th><th rowspan="2">First (Y)</th><th rowspan="2">First (Z)</th><th rowspan="2">Overflow</th><th rowspan="2">Water</th></tr><tr><th>PN</th><th>Name</th></tr><tr><th></th><th>Storm</th><th>Period</th><th>Change</th><th>Surcharge</th><th>Flood</th><th>Overflow</th><th>Act.</th><th>Level</th></tr><tr><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>(m)</th></tr><tr><td>1.000</td><td>1 240 Winter</td><td>100</td><td>+20%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>3.847</td></tr><tr><td>1.001</td><td>2 240 Winter</td><td>100</td><td>+20%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>3.846</td></tr><tr><td>2.000</td><td>re 240 Winter</td><td>100</td><td>+20%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>3.844</td></tr><tr><td>2.001</td><td>3 240 Winter</td><td>100</td><td>+20%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>3.844</td></tr><tr><td>2.002</td><td>4 240 Winter</td><td>100</td><td>+20%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>3.844</td></tr><tr><td>1.002</td><td>5 240 Winter</td><td>100</td><td>+20%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>3.846</td></tr></table>									US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	PN	Name		Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level									(m)	1.000	1 240 Winter	100	+20%	100/15 Summer				3.847	1.001	2 240 Winter	100	+20%	100/15 Summer				3.846	2.000	re 240 Winter	100	+20%	100/15 Summer				3.844	2.001	3 240 Winter	100	+20%	100/15 Summer				3.844	2.002	4 240 Winter	100	+20%	100/15 Summer				3.844	1.002	5 240 Winter	100	+20%	100/15 Summer				3.846
US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water																																																																																			
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<table><tr><th colspan="2">US/MH</th><th>Surcharged</th><th>Flooded</th><th colspan="2">Half Drain</th><th>Pipe</th><th colspan="2">Level</th></tr><tr><th>PN</th><th>Name</th><th>Depth</th><th>Volume</th><th>Flow /</th><th>Time</th><th>Flow</th><th>Status</th><th>Exceeded</th></tr><tr><th></th><th></th><th>(m)</th><th>(m³)</th><th>Cap.</th><th>(l/s)</th><th>(mins)</th><th>(l/s)</th><th></th></tr><tr><td>1.000</td><td>1</td><td>0.347</td><td>0.000</td><td>0.04</td><td></td><td></td><td>2.6</td><td>FLOOD RISK</td></tr></table>									US/MH		Surcharged	Flooded	Half Drain		Pipe	Level		PN	Name	Depth	Volume	Flow /	Time	Flow	Status	Exceeded			(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)		1.000	1	0.347	0.000	0.04			2.6	FLOOD RISK																																															
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9 Birchtree Way Maidstone Kent ME15 7RP		THE BUILDERS YARD LOWER RANGE ROAD GRAVESEND	
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Micro Drainage		Network 2020.1.3	

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

PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)						
1.001	2	0.496	0.000	0.03			2.6	FLOOD RISK	
2.000	re	0.294	0.000	0.02			1.3	FLOOD RISK	
2.001	3	0.394	0.000	0.03			1.9	FLOOD RISK	
2.002	4	0.444	0.000	0.03			1.8	FLOOD RISK	
1.002	5	0.596	0.000	0.02			1.2	FLOOD RISK	

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