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9 Birchtree Way Maidstone Kent ME15 7RP	THE BUILDERS YARD LOWER RANGE ROAD GRAVESEND	
Date 08/08/2022 13:35 File 1190-2202-PRE-DEV.MDX	Designed by RAC Checked by	
Micro Drainage Network 2020.1.3		

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

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

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.013	4-8	0.006

Total Area Contributing (ha) = 0.019

Total Pipe Volume (m³) = 1.414

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
1.000	20.000	0.200	100.0	0.009	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	20.000	0.200	100.0	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	20.000	0.200	100.0	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	20.000	0.200	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL E (m)	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	0.00	5.33	3.400	0.009	0.0	0.0	0.0	1.00	17.8	0.0
1.001	0.00	5.66	3.200	0.014	0.0	0.0	0.0	1.00	17.8	0.0
1.002	0.00	6.00	3.000	0.019	0.0	0.0	0.0	1.00	17.8	0.0
1.003	0.00	6.33	2.800	0.019	0.0	0.0	0.0	1.00	17.8	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)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	4.000	0.600	Open Manhole	450	1.000	3.400	150				
2	4.000	0.800	Open Manhole	450	1.001	3.200	150	1.000	3.200	150	
3	4.000	1.000	Open Manhole	450	1.002	3.000	150	1.001	3.000	150	
4	4.000	1.200	Open Manhole	450	1.003	2.800	150	1.002	2.800	150	
ex	4.000	1.400	Open Manhole	1200		OUTFALL		1.003	2.600	150	

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	150	1	4.000	3.400	0.450	Open Manhole	450
1.001	o	150	2	4.000	3.200	0.650	Open Manhole	450
1.002	o	150	3	4.000	3.000	0.850	Open Manhole	450
1.003	o	150	4	4.000	2.800	1.050	Open Manhole	450

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	20.000	100.0	2	4.000	3.200	0.650	Open Manhole	450
1.001	20.000	100.0	3	4.000	3.000	0.850	Open Manhole	450
1.002	20.000	100.0	4	4.000	2.800	1.050	Open Manhole	450
1.003	20.000	100.0	ex	4.000	2.600	1.250	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)
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1.003	ex	4.000	2.600	0.000	1200	0
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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	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)	26.250	Storm Duration (mins)	30
Ratio R	0.350		

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Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	1	0.095	0.353	0.000	0.449
1.001	2	0.127	0.353	0.000	0.481
1.002	3	0.159	0.353	0.000	0.512
1.003	4	0.191	0.353	0.000	0.544
Total		0.573	1.414	0.000	1.986

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	1	0.095	0.345	0.000	0.441
1.001	2	0.127	0.345	0.000	0.473
1.002	3	0.159	0.345	0.000	0.505
1.003	4	0.191	0.339	0.000	0.530
Total		0.573	1.375	0.000	1.948

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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	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	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	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)	30
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	1	15 Winter	30	+0%					3.449
1.001	2	15 Winter	30	+0%					3.264
1.002	3	15 Winter	30	+0%					3.076
1.003	4	15 Winter	30	+0%					2.875

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.101	0.000	0.23			3.9	OK	
1.001	2	-0.086	0.000	0.36			6.1	OK	
1.002	3	-0.074	0.000	0.49			8.2	OK	
1.003	4	-0.075	0.000	0.50			8.3	OK	