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Victoria Count Tennant St Nuneaton Warwickshire CV11 4LZ	CO22/293/07 Kennel Lane, Witherley 57 & 59 (2 Cottages) Rev B	
Date 12/09/2023 09:41 File MICRODRAINAGE NETWORK -...	Designed by PG Checked by BP	
XP Solutions	Network 2018.1	

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)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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	0.033	4-8	0.008

Total Area Contributing (ha) = 0.041

Total Pipe Volume (m³) = 1.064

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	12.110	0.155	78.1	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	22.635	0.310	73.0	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	9.215	0.400	23.0	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	13.670	0.195	70.1	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	2.600	0.030	86.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.18	72.270	0.014	0.0	0.0	0.0	1.14	20.1	1.9
1.001	50.00	5.50	72.115	0.025	0.0	0.0	0.0	1.18	20.8	3.4
2.000	50.00	5.07	72.400	0.008	0.0	0.0	0.0	2.11	37.2	1.1
2.001	50.00	5.26	72.000	0.016	0.0	0.0	0.0	1.20	21.3	2.2
1.002	50.00	5.54	71.805	0.041	0.0	0.0	0.0	1.08	19.1	5.6

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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	73.200	0.930	Open Manhole	1200	1.000	72.270	150		
2	73.150	1.035	Open Manhole	1200	1.001	72.115	150	1.000	72.115
3	73.150	0.750	Open Manhole	1200	2.000	72.400	150		
3	73.200	1.200	Open Manhole	1200	2.001	72.000	150	2.000	72.000
4	73.100	1.295	Open Manhole	1200	1.002	71.805	150	1.001	71.805
								2.001	71.805
	73.000	1.225	Open Manhole	0		OUTFALL	1.002	71.775	150

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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	73.200	72.270	0.780	Open Manhole	1200
1.001	o	150	2	73.150	72.115	0.885	Open Manhole	1200
2.000	o	150	3	73.150	72.400	0.600	Open Manhole	1200
2.001	o	150	3	73.200	72.000	1.050	Open Manhole	1200
1.002	o	150	4	73.100	71.805	1.145	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	12.110	78.1	2	73.150	72.115	0.885	Open Manhole	1200
1.001	22.635	73.0	4	73.100	71.805	1.145	Open Manhole	1200
2.000	9.215	23.0	3	73.200	72.000	1.050	Open Manhole	1200
2.001	13.670	70.1	4	73.100	71.805	1.145	Open Manhole	1200
1.002	2.600	86.7		73.000	71.775	1.075	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)
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1.002		73.000	71.775	0.000	0	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	3
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

Rainfall Model	FSR	Region	England and Wales
Return Period (years)	2	M5-60 (mm)	20.000

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XP Solutions	Network 2018.1	
<u>Synthetic Rainfall Details</u> Ratio R 0.400 Cv (Winter) 0.840 Profile Type Summer Storm Duration (mins) 30 Cv (Summer) 0.750		
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<u>Online Controls for Storm</u> <u>Orifice Manhole: 4, DS/PN: 1.002, Volume (m³): 2.1</u> Diameter (m) 0.028 Discharge Coefficient 0.600 Invert Level (m) 71.805		
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Storage Structures for Storm

Porous Car Park Manhole: 1, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	19.0
Max Percolation (l/s)	26.4	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.670	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: 3, DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	6.9	Slope (1:X)	30.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.620	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: 3, DS/PN: 2.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	5.0
Max Percolation (l/s)	4.2	Slope (1:X)	30.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.620	Cap Volume Depth (m)	0.400

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1 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	3						
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									
Rainfall Model	FSR	Ratio R	0.400						
Region England and Wales Cv (Summer)	0.750								
M5-60 (mm)	20.000	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, 30, 100								
Climate Change (%)	0, 0, 40								
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 Summer		1	+0%	30/15 Summer				72.302
1.001	2 60 Winter		1	+0%	1/60 Winter				72.269
2.000	3 15 Winter		1	+0%	30/15 Summer				72.418
2.001	3 60 Winter		1	+0%	1/15 Summer				72.268
1.002	4 60 Winter		1	+0%	1/15 Summer				72.266
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded	
1.000	1	-0.118	0.000	0.09		1.6	OK		
1.001	2	0.004	0.000	0.09		1.8	SURCHARGED		
2.000	3	-0.132	0.000	0.03		1.1	OK		
2.001	3	0.118	0.000	0.05		1.0	SURCHARGED		
1.002	4	0.311	0.000	0.10		1.1	SURCHARGED		

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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 3
 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

Rainfall Model FSR Ratio R 0.400
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 20.000 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, 30, 100
 Climate Change (%) 0, 0, 40

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 60 Winter		30	+0%	30/15 Summer			72.765
1.001	2 60 Winter		30	+0%	1/60 Winter			72.763
2.000	3 60 Winter		30	+0%	30/15 Summer			72.761
2.001	3 60 Winter		30	+0%	1/15 Summer			72.760
1.002	4 60 Winter		30	+0%	1/15 Summer			72.758

US/MH		Surcharged Flooded		Pipe		Level	
PN	Name	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status Exceeded
1.000	1	0.345	0.000	0.10		1.9	SURCHARGED
1.001	2	0.498	0.000	0.12		2.4	SURCHARGED
2.000	3	0.211	0.000	0.04		1.2	SURCHARGED
2.001	3	0.610	0.000	0.06		1.1	SURCHARGED
1.002	4	0.803	0.000	0.15		1.6	SURCHARGED

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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 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 Storage Structures 3
 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

Rainfall Model FSR Ratio R 0.400
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 20.000 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, 30, 100
 Climate Change (%) 0, 0, 40

									Water
US/MH	Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level		
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
1.000	1	120 Winter	100	+40%	30/15 Summer				72.959
1.001	2	120 Winter	100	+40%	1/60 Winter				72.957
2.000	3	120 Winter	100	+40%	30/15 Summer				72.956
2.001	3	120 Winter	100	+40%	1/15 Summer				72.955
1.002	4	120 Winter	100	+40%	1/15 Summer				72.952

Surcharged Flooded				Pipe				
US/MH	Depth	Volume	Flow /	Overflow	Pipe	Level		
PN	Name	(m)	(m ³)	Cap.	(l/s)	(l/s)	Status	Exceeded
1.000	1	0.539	0.000	0.06		1.1	FLOOD RISK	
1.001	2	0.692	0.000	0.11		2.1	FLOOD RISK	
2.000	3	0.406	0.000	0.03		0.9	FLOOD RISK	
2.001	3	0.805	0.000	0.05		1.0	FLOOD RISK	
1.002	4	0.997	0.000	0.16		1.7	FLOOD RISK	