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No. 8 Oak Green	8755	
Stanley Green Business Park	Mayton St	
Earl Rd, Cheadle Hulme, SK8 6QL	Network 1 - R3	
Date August2021	Designed by Robin Hall	
File Network 1 R2.MDX	Checked by AL	
Innovyze	Network 2014.1.1	

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)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.361	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S1.000	28.500	0.171	167.0	0.035	5.00	0.0	0.600	o	225	
S1.001	5.950	0.036	167.0	0.030	0.00	0.0	0.600	o	225	
S1.002	16.450	0.099	166.2	0.054	0.00	0.0	0.600	o	225	
S1.003	18.450	0.110	167.0	0.042	0.00	0.0	0.600	o	225	
S1.004	12.675	0.076	167.0	0.030	0.00	0.0	0.600	o	225	
S1.005	6.450	0.091	70.9	0.000	0.00	0.0	0.600	o	150	

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)
S1.000	45.10	5.47	54.500	0.035	0.0	0.0	0.0	1.01	40.1	4.3
S1.001	44.75	5.57	54.329	0.065	0.0	0.0	0.0	1.01	40.1	7.9
S1.002	43.81	5.84	54.294	0.119	0.0	0.0	0.0	1.01	40.2	14.1
S1.003	42.82	6.14	54.195	0.161	0.0	0.0	0.0	1.01	40.1	18.7
S1.004	42.16	6.35	54.084	0.191	0.0	0.0	0.0	1.01	40.1	21.8
S1.005	41.89	6.44	53.891	0.191	0.0	0.0	0.0	1.20	21.1«	21.8

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.035	0.035	0.035
1.001	-	-	100	0.030	0.030	0.030
1.002	-	-	100	0.054	0.054	0.054
1.003	-	-	100	0.042	0.042	0.042
1.004	-	-	100	0.030	0.030	0.030
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.191	0.191	0.191

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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S1.005	SC1	56.550	53.800	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 * 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	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

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)	18.000	Storm Duration (mins)	30
Ratio R	0.361		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: S6, DS/PN: S1.005, Volume (m³): 7.7

Unit Reference	MD-SHE-0102-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	102
Invert Level (m)	53.891
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0
Flush-Flo™	0.353	4.9
Kick-Flo®	0.740	4.0
Mean Flow over Head Range	-	4.3

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)
0.100	3.4	1.200	5.0	3.000	7.6	7.000	11.4
0.200	4.7	1.400	5.3	3.500	8.2	7.500	11.8
0.300	4.9	1.600	5.7	4.000	8.7	8.000	12.1
0.400	4.9	1.800	6.0	4.500	9.2	8.500	12.5
0.500	4.8	2.000	6.3	5.000	9.7	9.000	12.8
0.600	4.6	2.200	6.6	5.500	10.2	9.500	13.2
0.800	4.1	2.400	6.9	6.000	10.6		
1.000	4.6	2.600	7.1	6.500	11.0		

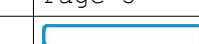
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Storage Structures for Storm

Cellular Storage Manhole: S6, DS/PN: S1.005

Invert Level (m) 54.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	55.0	55.0	1.200	55.0	90.6
0.400	55.0	66.9	1.201	0.0	90.6
0.800	55.0	78.7			

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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 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

Rainfall Model FSR Ratio R 0.362
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine 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
 Return Period(s) (years) 100
 Climate Change (%) 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	100	+40%	100/15	Summer			
S1.001	15 Winter	100	+40%	100/15	Summer			
S1.002	15 Winter	100	+40%	100/15	Summer			
S1.003	15 Winter	100	+40%	100/15	Summer			
S1.004	120 Winter	100	+40%	100/15	Summer			
S1.005	120 Winter	100	+40%	100/15	Summer			

PN	US/MH Name	Water		Flooded		Pipe		Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Flow (l/s)	
S1.000	S1	55.424	0.699	0.000	0.42	0.0	15.7	SURCHARGED
S1.001	S2	55.388	0.833	0.000	0.92	0.0	27.4	SURCHARGED
S1.002	S3	55.324	0.805	0.000	1.36	0.0	48.7	SURCHARGED
S1.003	S4	55.133	0.713	0.000	1.84	0.0	66.4	SURCHARGED
S1.004	S5	55.101	0.792	0.000	0.89	0.0	30.6	SURCHARGED
S1.005	S6	55.092	1.051	0.000	0.28	0.0	5.0	SURCHARGED