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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 02/05/2025 12:17 File 11258 - Surface Water_A...	Designed by CMangly Checked by	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

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
S1.000	8.313	1.025	8.1	0.154	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	14.028	0.600	23.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	10.224	0.125	81.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	42.000	2.900	14.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

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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)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	62.450	0.475	Junction		S1.000	61.975	150				
S1	62.050	1.200	Open Manhole	1200	S1.001	60.850	300	S1.000	60.950	150	
S2	61.250	1.000	Junction		S1.002	60.250	300	S1.001	60.250	300	
S2	61.050	1.150	Open Manhole	1200	S1.003	59.900	150	S1.002	60.125	300	375
S	58.000	1.000	Open Manhole	0		OUTFALL		S1.003	57.000	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	298.920	59.618			No Entry	
S1	290.607	59.612	290.607	59.612	Required	
S2	290.599	73.641			No Entry	
S2	280.375	73.641	280.375	73.641	Required	
S	280.319	31.641			No Entry	

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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)
S1.000	o	150	S1	62.450	61.975	0.325	Junction	
S1.001	o	300	S1	62.050	60.850	0.900	Open Manhole	1200
S1.002	o	300	S2	61.250	60.250	0.700	Junction	
S1.003	o	150	S2	61.050	59.900	1.000	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)
S1.000	8.313	8.1	S1	62.050	60.950	0.950	Open Manhole	1200
S1.001	14.028	23.4	S2	61.250	60.250	0.700	Junction	
S1.002	10.224	81.8	S2	61.050	60.125	0.625	Open Manhole	1200
S1.003	42.000	14.5	S	58.000	57.000	0.850	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)
S1.003	S	58.000	57.000	0.000	0	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	2
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)	18.500	Storm Duration (mins)	30
Ratio R	0.331		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S2, DS/PN: S1.003, Volume (m³): 2.0

Unit Reference	MD-SHE-0065-1800-0900-1800
Design Head (m)	0.900
Design Flow (l/s)	1.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	65
Invert Level (m)	59.900
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	1.8
Flush-Flo™	0.276	1.8
Kick-Flo®	0.563	1.5
Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.1	3.000	3.1	7.000	4.6
0.200	1.8	1.400	2.2	3.500	3.4	7.500	4.8
0.300	1.8	1.600	2.3	4.000	3.6	8.000	4.9
0.400	1.8	1.800	2.5	4.500	3.8	8.500	5.1
0.500	1.6	2.000	2.6	5.000	4.0	9.000	5.2
0.600	1.5	2.200	2.7	5.500	4.1	9.500	5.4
0.800	1.7	2.400	2.8	6.000	4.3		
1.000	1.9	2.600	2.9	6.500	4.5		

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Storage Structures for Storm

Porous Car Park Manhole: S1, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	70.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	388.9	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	61.975	Membrane Depth (mm)	0

Cellular Storage Manhole: S2, DS/PN: S1.002

Invert Level (m)	60.250	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	350.0	350.0	5.200	0.0	394.9
0.400	350.0	379.9	5.600	0.0	394.9
0.800	0.0	394.9	6.000	0.0	394.9
1.200	0.0	394.9	6.400	0.0	394.9
1.600	0.0	394.9	6.800	0.0	394.9
2.000	0.0	394.9	7.200	0.0	394.9
2.400	0.0	394.9	7.600	0.0	394.9
2.800	0.0	394.9	8.000	0.0	394.9
3.200	0.0	394.9	8.400	0.0	394.9
3.600	0.0	394.9	8.800	0.0	394.9
4.000	0.0	394.9	9.200	0.0	394.9
4.400	0.0	394.9	9.600	0.0	394.9
4.800	0.0	394.9	10.000	0.0	394.9

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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 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 2

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 0.326

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.500

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5

Second Increment (Extended)

DTS Status OFF

DVD Status OFF

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

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	60 Winter	1	+0%					62.010
S1.001	S1	60 Winter	1	+0%					60.889
S1.002	S2	360 Winter	1	+0%					60.279
S1.003	S2	360 Winter	1	+0%	1/240 Winter				60.102

PN	US/MH Name	Depth (m)	Surcharged Volume (m³)	Flooded Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.115	0.000	0.13	11	8.0	OK*	
S1.001	S1	-0.261	0.000	0.04		8.0	OK	
S1.002	S2	-0.271	0.000	0.02	128	1.8	OK*	
S1.003	S2	0.052	0.000	0.04		1.8	SURCHARGED	

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<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>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 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 2				
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 0.326		
Region England and Wales Cv (Summer)					0.750				
M5-60 (mm)					18.500 Cv (Winter)		0.840		
Margin for Flood Risk Warning (mm)					300.0				
Analysis Timestep 2.5 Second Increment (Extended)									
DTS Status					OFF				
DVD Status					OFF				
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				
Return Period(s) (years)					1, 30, 100				
Climate Change (%)					0, 0, 45				

