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33 Beaumaris Drive Gedling Nottingham NG4 2RA		
Date 01/01/0001 File E970 - NETWORK 3 (V4 JU...	Designed by SteveDaykin Checked by	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for NETWORK 3 STORM.SWS

Pipe Sizes E970 - NETWORK 4 (V2) Manhole Sizes E970 - NETWORK 4 (V2)

FSR Rainfall Model - England and Wales			
Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	10
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	0.000
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)	0.75
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for NETWORK 3 STORM.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.752	4-8	0.835

Total Area Contributing (ha) = 1.587

Total Pipe Volume (m³) = 131.285

Network Design Table for NETWORK 3 STORM.SWS

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	18.613	0.436	42.7	0.192	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	71.892	0.979	73.4	0.242	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.002	10.647	0.425	25.1	0.229	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	35.983	1.525	23.6	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	50.329	3.225	15.6	0.015	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.000	51.087	0.450	113.5	0.208	5.00	0.0	0.600	o	375	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)
1.000	0.00	5.13	119.040	0.192	0.0	0.0	0.0	2.41	170.6	0.0
1.001	0.00	5.69	118.529	0.434	0.0	0.0	0.0	2.12	233.8	0.0
1.002	0.00	5.74	117.475	0.663	0.0	0.0	0.0	4.07	648.1	0.0
1.003	0.00	5.88	117.050	0.663	0.0	0.0	0.0	4.20	667.9	0.0
1.004	0.00	6.04	115.525	0.678	0.0	0.0	0.0	5.17	821.7	0.0
2.000	0.00	5.50	113.050	0.208	0.0	0.0	0.0	1.70	187.7	0.0

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Network Design Table for NETWORK 3 STORM.SWS

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
2.001	12.323	0.225	54.8	0.044	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	58.744	1.625	36.2	0.062	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.006	65.914	0.975	67.6	0.115	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.007	29.671	0.957	31.0	0.118	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.008	36.668	1.018	36.0	0.145	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.009	15.961	0.050	319.2	0.124	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.010	37.059	0.275	134.8	0.093	0.00	0.0	0.600	o	750	Pipe/Conduit	
1.011	22.929	0.100	229.3	0.000	0.00	0.0	0.600	ooo	-1	Pipe/Conduit	
1.012	17.562	0.075	234.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.013	5.000	0.050	100.0	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)
2.001	0.00	5.58	112.600	0.252	0.0	0.0	0.0	2.45	270.9	0.0
1.005	0.00	6.33	112.300	0.992	0.0	0.0	0.0	3.39	539.2	0.0
1.006	0.00	6.70	110.525	1.107	0.0	0.0	0.0	2.96	838.3	0.0
1.007	0.00	6.82	109.550	1.225	0.0	0.0	0.0	4.38	1239.6	0.0
1.008	0.00	6.97	108.593	1.370	0.0	0.0	0.0	4.07	1149.8	0.0
1.009	0.00	7.16	107.575	1.494	0.0	0.0	0.0	1.36	383.8	0.0
1.010	0.00	7.42	107.425	1.587	0.0	0.0	0.0	2.41	1064.3	0.0
1.011	0.00	7.63	107.150	1.587	0.0	0.0	0.0	1.84	2443.8	0.0
1.012	0.00	7.91	107.050	1.587	0.0	0.0	0.0	1.02	72.3	0.0
1.013	0.00	7.96	106.975	1.587	0.0	0.0	0.0	1.57	111.1	0.0

Conduit Sections for NETWORK 3 STORM.SWS

NOTE: Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \ / open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m ²)
-1	ooo	2250	750			0.750	1.325

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Online Controls for NETWORK 3 STORM.SWS

Hydro-Brake® Optimum Manhole: 312, DS/PN: 1.012, Volume (m³): 37.4

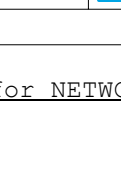
Unit Reference	MD-SHE-0115-7000-1550-7000
Design Head (m)	1.550
Design Flow (l/s)	7.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	115
Invert Level (m)	107.050
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.550	7.0
Flush-Flo™	0.456	7.0
Kick-Flo®	0.945	5.6
Mean Flow over Head Range	-	6.1

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	4.1	1.200	6.2	3.000	9.5	7.000	14.3
0.200	6.3	1.400	6.7	3.500	10.3	7.500	14.8
0.300	6.8	1.600	7.1	4.000	10.9	8.000	15.2
0.400	7.0	1.800	7.5	4.500	11.6	8.500	15.7
0.500	7.0	2.000	7.9	5.000	12.2	9.000	16.1
0.600	6.9	2.200	8.2	5.500	12.7	9.500	16.5
0.800	6.4	2.400	8.6	6.000	13.3		
1.000	5.7	2.600	8.9	6.500	13.8		

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<u>Storage Structures for NETWORK 3 STORM.SWS</u> <u>Tank or Pond Manhole: 312, DS/PN: 1.012</u> Invert Level (m) 107.100 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>930.0</td><td>1.500</td><td>1430.0</td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	930.0	1.500	1430.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)							
0.000	930.0	1.500	1430.0							
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Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 3

STORM.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	7.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	1.000
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	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	0.400
Region England and Wales Cv (Summer)	1.000		
M5-60 (mm)	20.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	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 (%)	40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	300	30 Summer	100	+40%	100/30 Summer	100/30 Summer		
1.001	301	30 Summer	100	+40%	100/30 Summer	100/30 Summer		
1.002	302	30 Summer	100	+40%	100/30 Summer			
1.003	303	30 Summer	100	+40%				
1.004	304	30 Summer	100	+40%				
2.000	315	30 Summer	100	+40%	100/30 Summer			
2.001	316	30 Summer	100	+40%	100/30 Summer			
1.005	306	30 Summer	100	+40%	100/30 Summer			
1.006	307	30 Summer	100	+40%	100/30 Summer			
1.007	308	30 Summer	100	+40%	100/30 Summer			
1.008	305	30 Summer	100	+40%	100/30 Summer			
1.009	309	30 Summer	100	+40%	100/30 Summer			
1.010	310	2880 Summer	100	+40%	100/30 Summer			
1.011	311	2880 Summer	100	+40%	100/60 Summer			
1.012	312	2880 Summer	100	+40%	100/30 Summer			
1.013	16	720 Summer	100	+40%	100/360 Summer			

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Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 3
STORM.SWS

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	300	120.594	1.254	0.005	0.97		142.8	FLOOD	1
1.001	301	120.167	1.263	0.312	1.41		311.0	FLOOD	1
1.002	302	118.208	0.283	0.000	1.28		471.6	SURCHARGED	
1.003	303	117.360	-0.140	0.000	0.81		473.7	OK	
1.004	304	115.791	-0.184	0.000	0.65		484.7	OK	
2.000	315	114.645	1.220	0.000	0.79		137.4	FLOOD RISK	
2.001	316	114.365	1.390	0.000	0.86		160.3	SURCHARGED	
1.005	306	114.196	1.446	0.000	1.34		664.6	SURCHARGED	
1.006	307	111.244	0.119	0.000	0.95		718.9	SURCHARGED	
1.007	308	110.366	0.216	0.000	0.79		774.8	SURCHARGED	
1.008	305	109.787	0.594	0.000	0.86		835.5	SURCHARGED	
1.009	309	109.039	0.864	0.000	3.25		892.1	FLOOD RISK	
1.010	310	108.466	0.291	0.000	0.06		50.5	SURCHARGED	
1.011	311	108.465	0.565	0.000	0.03		50.0	FLOOD RISK	
1.012	312	108.465	1.115	0.000	0.11		7.0	FLOOD RISK	
1.013	16	107.589	0.314	0.000	0.11		7.0	SURCHARGED	