

Keytech Development Design Ltd		Page 1
46 Sandbach Road Congleton Cheshire CW12 4LW	Black Lane Whiston 100year30minWint+30 cc	
Date nov 16 File SW Storage.mdx	Designed by gb Checked by	
XP Solutions	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)	100	Add Flow / Climate Change (%)	30
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.350	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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.204	4-8	0.032

Total Area Contributing (ha) = 0.236

Total Pipe Volume (m³) = 1.944

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)
1.000	10.000	0.100	100.0	0.086	4.00	0.0	0.600	o	150
1.001	10.000	0.375	26.7	0.000	0.00	0.0	0.600	o	150
2.000	10.000	0.100	100.0	0.150	4.00	0.0	0.600	o	225
2.001	10.000	0.200	50.0	0.000	0.00	0.0	0.600	o	225
1.002	10.000	0.067	150.0	0.000	0.00	0.0	0.600	o	225

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	50.00	4.17	101.850	0.086	0.0	0.0	3.5	1.00	17.8	15.1
1.001	50.00	4.25	101.000	0.086	0.0	0.0	3.5	1.96	34.6	15.1
2.000	50.00	4.13	101.850	0.150	0.0	0.0	6.1	1.31	52.0	26.4
2.001	50.00	4.22	100.750	0.150	0.0	0.0	6.1	1.85	73.7	26.4
1.002	50.00	4.41	100.550	0.236	0.0	0.0	9.6	1.07	42.4	41.5

Keytech Development Design Ltd		Page 2
46 Sandbach Road Congleton Cheshire CW12 4LW	Black Lane Whiston 100year30minWint+30 cc	
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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)
1.003	10.000	0.067	150.0	0.000	0.00	0.0	0.600	o	225

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)
1.003	50.00	4.56	100.483	0.236	0.0	0.0	9.6	1.07	42.4	41.5

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		103.000	100.417	101.125	1500	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	0.000
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.350		

Keytech Development Design Ltd		Page 3
46 Sandbach Road Congleton Cheshire CW12 4LW	Black Lane Whiston 100year30minWint+30 cc	
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Online Controls for Storm Orifice Manhole: 6, DS/PN: 1.003, Volume (m³): 2.6 Diameter (m) 0.049 Discharge Coefficient 0.600 Invert Level (m) 100.483		
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Keytech Development Design Ltd		Page 4
46 Sandbach Road Congleton Cheshire CW12 4LW	Black Lane Whiston 100year30minWint+30 cc	
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Storage Structures for Storm

Tank or Pond Manhole: 2, DS/PN: 1.001

Invert Level (m) 101.100

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	40.0	0.750	40.0

Tank or Pond Manhole: 4, DS/PN: 2.001

Invert Level (m) 100.750

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	60.0	1.000	60.0

Keytech Development Design Ltd		Page 5
46 Sandbach Road Congleton Cheshire CW12 4LW	Black Lane Whiston 100year30minWint+30 cc	
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Summary of Results for 30 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 150.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

		Water	Surcharged	Flooded			Pipe	
	US/MH	Level	Depth	Volume	Flow / Overflow	Flow		
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)	Status
1.000	1	102.434	0.434	0.000	2.31	0.0	36.5	SURCHARGED
1.001	2	101.542	0.392	0.000	0.54	0.0	16.5	SURCHARGED
2.000	3	102.188	0.113	0.000	1.48	0.0	64.0	SURCHARGED
2.001	4	101.540	0.565	0.000	0.09	0.0	5.8	SURCHARGED
1.002	5	101.578	0.803	0.000	0.17	0.0	6.0	SURCHARGED
1.003	6	101.596	0.888	0.000	0.14	0.0	5.1	SURCHARGED