

The Civil Engineering Practice										Page 1																																																																																																																																																																																																																
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<u>STORM SEWER DESIGN by the Modified Rational Method</u> <u>Design Criteria for NETWORK 6.SWS</u> Pipe Sizes NETWORK 9 Manhole Sizes NETWORK 9 FSR Rainfall Model - England and Wales <table><tr><td>Return Period (years)</td><td>2</td><td>PIMP (%)</td><td>100</td></tr><tr><td>M5-60 (mm)</td><td>19.600</td><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>Ratio R</td><td>0.350</td><td>Minimum Backdrop Height (m)</td><td>0.500</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>50</td><td>Maximum Backdrop Height (m)</td><td>1.000</td></tr><tr><td>Maximum Time of Concentration (mins)</td><td>30</td><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Foul Sewage (l/s/ha)</td><td>0.000</td><td>Min Vel for Auto Design only (m/s)</td><td>0.75</td></tr><tr><td>Volumetric Runoff Coeff.</td><td>0.750</td><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr></table> Designed with Level Soffits												Return Period (years)	2	PIMP (%)	100	M5-60 (mm)	19.600	Add Flow / Climate Change (%)	0	Ratio R	0.350	Minimum Backdrop Height (m)	0.500	Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.000	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.	0.750	Min Slope for Optimisation (1:X)	500																																																																																																																																																																																			
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<u>PIPELINE SCHEDULES for NETWORK 6.SWS</u> <u>Upstream Manhole</u> <table><tr><th>PN</th><th>Hyd Sect</th><th>Diam (mm)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr><tr><td>1.000</td><td>o</td><td>100</td><td>1</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.001</td><td>o</td><td>100</td><td>2</td><td>16.250</td><td>15.524</td><td>0.627</td><td>Open Manhole</td><td>1200</td></tr><tr><td>2.000</td><td>o</td><td>100</td><td>8</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.002</td><td>o</td><td>100</td><td>3</td><td>16.250</td><td>15.426</td><td>0.724</td><td>Open Manhole</td><td>1200</td></tr><tr><td>3.000</td><td>o</td><td>100</td><td>9</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.003</td><td>o</td><td>100</td><td>4</td><td>16.250</td><td>15.413</td><td>0.737</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.004</td><td>o</td><td>100</td><td>5</td><td>16.250</td><td>15.361</td><td>0.789</td><td>Open Manhole</td><td>1200</td></tr><tr><td>4.000</td><td>o</td><td>100</td><td>10</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>5.000</td><td>o</td><td>100</td><td>11</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.005</td><td>o</td><td>100</td><td>6</td><td>16.250</td><td>15.307</td><td>0.843</td><td>Open Manhole</td><td>1200</td></tr></table> <u>Downstream Manhole</u> <table><tr><th>PN</th><th>Length (m)</th><th>Slope (1:X)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr><tr><td>1.000</td><td>13.024</td><td>103.0</td><td>2</td><td>16.250</td><td>15.524</td><td>0.627</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.001</td><td>10.052</td><td>103.0</td><td>3</td><td>16.250</td><td>15.426</td><td>0.724</td><td>Open Manhole</td><td>1200</td></tr><tr><td>2.000</td><td>14.867</td><td>66.3</td><td>3</td><td>16.250</td><td>15.426</td><td>0.724</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.002</td><td>1.369</td><td>103.0</td><td>4</td><td>16.250</td><td>15.413</td><td>0.737</td><td>Open Manhole</td><td>1200</td></tr><tr><td>3.000</td><td>15.130</td><td>63.7</td><td>4</td><td>16.250</td><td>15.413</td><td>0.737</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.003</td><td>5.348</td><td>103.0</td><td>5</td><td>16.250</td><td>15.361</td><td>0.789</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.004</td><td>5.497</td><td>102.9</td><td>6</td><td>16.250</td><td>15.307</td><td>0.843</td><td>Open Manhole</td><td>1200</td></tr><tr><td>4.000</td><td>7.128</td><td>20.8</td><td>6</td><td>16.250</td><td>15.307</td><td>0.843</td><td>Open Manhole</td><td>1200</td></tr><tr><td>5.000</td><td>7.444</td><td>21.7</td><td>6</td><td>16.250</td><td>15.307</td><td>0.843</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.005</td><td>9.975</td><td>102.9</td><td>7</td><td>16.300</td><td>15.210</td><td>0.990</td><td>Open Manhole</td><td>0</td></tr></table>									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	100	1	16.250	15.650	0.500	Open Manhole	1200	1.001	o	100	2	16.250	15.524	0.627	Open Manhole	1200	2.000	o	100	8	16.250	15.650	0.500	Open Manhole	1200	1.002	o	100	3	16.250	15.426	0.724	Open Manhole	1200	3.000	o	100	9	16.250	15.650	0.500	Open Manhole	1200	1.003	o	100	4	16.250	15.413	0.737	Open Manhole	1200	1.004	o	100	5	16.250	15.361	0.789	Open Manhole	1200	4.000	o	100	10	16.250	15.650	0.500	Open Manhole	1200	5.000	o	100	11	16.250	15.650	0.500	Open Manhole	1200	1.005	o	100	6	16.250	15.307	0.843	Open Manhole	1200	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	13.024	103.0	2	16.250	15.524	0.627	Open Manhole	1200	1.001	10.052	103.0	3	16.250	15.426	0.724	Open Manhole	1200	2.000	14.867	66.3	3	16.250	15.426	0.724	Open Manhole	1200	1.002	1.369	103.0	4	16.250	15.413	0.737	Open Manhole	1200	3.000	15.130	63.7	4	16.250	15.413	0.737	Open Manhole	1200	1.003	5.348	103.0	5	16.250	15.361	0.789	Open Manhole	1200	1.004	5.497	102.9	6	16.250	15.307	0.843	Open Manhole	1200	4.000	7.128	20.8	6	16.250	15.307	0.843	Open Manhole	1200	5.000	7.444	21.7	6	16.250	15.307	0.843	Open Manhole	1200	1.005	9.975	102.9	7	16.300	15.210	0.990	Open Manhole	0
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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		0																																																																																																																																				
Number of Online Controls		0		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		0.350																																																																																																																																				
Region England and Wales Cv (Summer)		0.750																																																																																																																																								
M5-60 (mm)		19.500		Cv (Winter)		0.840																																																																																																																																				
Margin for Flood Risk Warning (mm)		300.0		DVD Status		OFF																																																																																																																																				
Analysis Timestep		Fine		Inertia Status		OFF																																																																																																																																				
DTS Status		ON																																																																																																																																								
Profile(s)		Summer and Winter																																																																																																																																								
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Return Period(s) (years)		100																																																																																																																																								
Climate Change (%)		40																																																																																																																																								
<table><tr><td></td><td>US/MH</td><td></td><td>Return</td><td>Climate</td><td>First (X)</td><td>First (Y)</td><td>First (Z)</td><td>Overflow</td><td>Water</td></tr><tr><td>PN</td><td>Name</td><td>Storm</td><td>Period</td><td>Change</td><td>Surcharge</td><td>Flood</td><td>Overflow</td><td>Act.</td><td>Level</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>(m)</td></tr><tr><td>1.000</td><td>1</td><td>60 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.650</td></tr><tr><td>1.001</td><td>2</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Winter</td><td></td><td></td><td></td><td>15.633</td></tr><tr><td>2.000</td><td>8</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.689</td></tr><tr><td>1.002</td><td>3</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>15.622</td></tr><tr><td>3.000</td><td>9</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.683</td></tr><tr><td>1.003</td><td>4</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>15.614</td></tr><tr><td>1.004</td><td>5</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>15.556</td></tr><tr><td>4.000</td><td>10</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.675</td></tr><tr><td>5.000</td><td>11</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.664</td></tr><tr><td>1.005</td><td>6</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>15.489</td></tr></table>										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	100	+40%					15.650	1.001	2	15 Winter	100	+40%	100/15 Winter				15.633	2.000	8	15 Winter	100	+40%					15.689	1.002	3	15 Winter	100	+40%	100/15 Summer				15.622	3.000	9	15 Winter	100	+40%					15.683	1.003	4	15 Winter	100	+40%	100/15 Summer				15.614	1.004	5	15 Winter	100	+40%	100/15 Summer				15.556	4.000	10	15 Winter	100	+40%					15.675	5.000	11	15 Winter	100	+40%					15.664	1.005	6	15 Winter	100	+40%	100/15 Summer				15.489
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water																																																																																																																																	
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<table><tr><td colspan="5">Surcharged Flooded</td><td colspan="2">Pipe</td><td colspan="2"></td></tr><tr><td>PN</td><td>US/MH</td><td>Depth</td><td>Volume</td><td>Flow /</td><td>Overflow</td><td>Pipe</td><td></td><td>Level</td></tr><tr><td></td><td>Name</td><td>(m)</td><td>(m³)</td><td>Cap.</td><td>(l/s)</td><td>Flow</td><td>Status</td><td>Exceeded</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td>(l/s)</td><td></td><td></td></tr><tr><td>1.000</td><td>1</td><td>-0.100</td><td>0.000</td><td>0.00</td><td></td><td>0.0</td><td>OK</td><td></td></tr><tr><td>1.001</td><td>2</td><td>0.010</td><td>0.000</td><td>0.42</td><td></td><td>2.3</td><td>SURCHARGED</td><td></td></tr><tr><td>2.000</td><td>8</td><td>-0.061</td><td>0.000</td><td>0.32</td><td></td><td>2.3</td><td>OK</td><td></td></tr><tr><td>1.002</td><td>3</td><td>0.096</td><td>0.000</td><td>0.82</td><td></td><td>3.2</td><td>SURCHARGED</td><td></td></tr><tr><td>3.000</td><td>9</td><td>-0.067</td><td>0.000</td><td>0.23</td><td></td><td>1.7</td><td>OK</td><td></td></tr><tr><td>1.003</td><td>4</td><td>0.102</td><td>0.000</td><td>1.06</td><td></td><td>5.5</td><td>SURCHARGED</td><td></td></tr></table>									Surcharged Flooded					Pipe				PN	US/MH	Depth	Volume	Flow /	Overflow	Pipe		Level		Name	(m)	(m³)	Cap.	(l/s)	Flow	Status	Exceeded							(l/s)			1.000	1	-0.100	0.000	0.00		0.0	OK		1.001	2	0.010	0.000	0.42		2.3	SURCHARGED		2.000	8	-0.061	0.000	0.32		2.3	OK		1.002	3	0.096	0.000	0.82		3.2	SURCHARGED		3.000	9	-0.067	0.000	0.23		1.7	OK		1.003	4	0.102	0.000	1.06		5.5	SURCHARGED																																									
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<u>Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 6.SWS</u>							
		Surcharged Flooded			Pipe		
	US/MH	Depth	Volume	Flow / Overflow	Flow		Level
PN	Name	(m)	(m³)	Cap.	(l/s)	(l/s)	Status Exceeded
1.004	5	0.096	0.000	1.12		5.9	SURCHARGED
4.000	10	-0.075	0.000	0.14		1.7	OK
5.000	11	-0.086	0.000	0.05		0.6	OK
1.005	6	0.082	0.000	1.37		7.6	SURCHARGED
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