STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.200	Add Flow / Climate Change (%)	10
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.339	4-8	1.595	8-12	0.234

Total Area Contributing (ha) = 2.167

Total Pipe Volume (m³) = 178.567

Network Design Table for Surface Network 1

« - 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)	Section Type	Auto Design
1.000	14.306	0.035	408.7	0.046	5.00	0.0	0.600	o	450	Pipe/Conduit	
1.001	8.958	0.023	389.5	0.015	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.002	31.447	0.079	398.1	0.052	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	29.991	0.077	389.5	0.023	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	23.591	0.058	406.7	0.043	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.24	47.092	0.046	0.0	0.0	0.6	1.00	158.9	6.9
1.001	50.00	5.38	47.057	0.061	0.0	0.0	0.8	1.02	162.9	9.1
1.002	50.00	5.90	47.034	0.113	0.0	0.0	1.5	1.01	161.1	16.8
1.003	50.00	6.39	46.955	0.136	0.0	0.0	1.8	1.02	162.9	20.3
1.004	50.00	6.78	46.878	0.179	0.0	0.0	2.4	1.00	159.3	26.7

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Network Design Table for Surface Network 1

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
2.000	20.077	0.050	401.5	0.075	5.00	0.0	0.600	o	450	Pipe/Conduit	
2.001	4.035	0.010	403.5	0.006	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.002	36.801	0.091	404.4	0.089	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.003	9.751	0.030	325.0	0.003	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.005	12.095	0.027	448.0	0.089	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.006	19.462	0.048	405.5	0.019	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	47.965	0.343	139.8	0.089	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	10.865	0.024	452.7	0.003	0.00	0.0	0.600	o	450	Pipe/Conduit	
4.000	24.239	0.099	244.8	0.067	5.00	0.0	0.600	o	300	Pipe/Conduit	
4.001	7.003	0.029	241.5	0.024	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.002	42.996	0.096	447.9	0.087	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.000	33.966	0.139	244.4	0.073	5.00	0.0	0.600	o	300	Pipe/Conduit	
3.003	11.925	0.026	458.7	0.012	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.000	15.890	0.064	248.3	0.028	5.00	0.0	0.600	o	300	Pipe/Conduit	
6.001	17.715	0.071	249.5	0.005	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.002	40.218	0.161	249.8	0.058	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	50.00	5.33	46.995	0.075	0.0	0.0	1.0	1.01	160.4	11.2
2.001	50.00	5.40	46.946	0.081	0.0	0.0	1.1	1.01	160.0	12.1
2.002	50.00	6.01	46.935	0.170	0.0	0.0	2.3	1.00	159.8	25.3
2.003	50.00	6.15	46.845	0.173	0.0	0.0	2.3	1.12	178.5	25.8
1.005	50.00	6.99	46.826	0.441	0.0	0.0	6.0	0.95	151.7	65.7
1.006	50.00	7.32	46.791	0.460	0.0	0.0	6.2	1.00	159.6	68.5
3.000	50.00	5.72	47.462	0.089	0.0	0.0	1.2	1.10	43.9	13.3
3.001	50.00	5.92	46.933	0.092	0.0	0.0	1.2	0.95	150.9	13.7
4.000	50.00	5.40	47.187	0.067	0.0	0.0	0.9	1.00	70.7	10.0
4.001	50.00	5.52	47.088	0.091	0.0	0.0	1.2	1.01	71.2	13.6
3.002	50.00	6.67	46.909	0.270	0.0	0.0	3.7	0.95	151.7	40.2
5.000	50.00	5.57	47.103	0.073	0.0	0.0	1.0	1.00	70.8	10.9
3.003	50.00	6.88	46.813	0.355	0.0	0.0	4.8	0.94	149.9	52.9
6.000	50.00	5.27	47.359	0.028	0.0	0.0	0.4	0.99	70.2	4.2
6.001	50.00	5.56	47.295	0.033	0.0	0.0	0.4	0.99	70.0	4.9
6.002	50.00	6.24	47.224	0.091	0.0	0.0	1.2	0.99	70.0	13.6

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Network Design Table for Surface Network 1

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
6.003	19.651	0.079	248.7	0.021	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.004	12.233	0.049	249.7	0.005	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.004	20.007	0.044	454.7	0.004	0.00	0.0	0.600	o	450	Pipe/Conduit	
7.000	35.733	0.117	305.4	0.075	5.00	0.0	0.600	o	450	Pipe/Conduit	
7.001	19.848	0.056	354.4	0.008	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.007	72.713	0.180	405.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.008	65.094	0.145	448.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
8.000	30.889	0.076	406.4	0.116	5.00	0.0	0.600	o	450	Pipe/Conduit	
8.001	7.610	0.019	400.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
8.002	32.156	0.079	407.0	0.116	0.00	0.0	0.600	o	450	Pipe/Conduit	
8.003	54.769	0.135	405.7	0.099	0.00	0.0	0.600	o	450	Pipe/Conduit	
8.004	13.653	0.034	401.6	0.101	0.00	0.0	0.600	o	450	Pipe/Conduit	
8.005	40.560	0.100	405.6	0.052	0.00	0.0	0.600	o	450	Pipe/Conduit	
8.006	44.832	0.111	403.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
9.000	16.922	0.042	402.9	0.094	5.00	0.0	0.600	o	450	Pipe/Conduit	
9.001	8.840	0.022	401.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
9.002	32.887	0.082	401.1	0.036	0.00	0.0	0.600	o	450	Pipe/Conduit	
9.003	22.788	0.056	406.9	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
6.003	50.00	6.57	47.064	0.112	0.0	0.0	1.5	0.99	70.1	16.7
6.004	50.00	6.78	46.985	0.117	0.0	0.0	1.6	0.99	70.0	17.4
3.004	50.00	7.23	46.787	0.476	0.0	0.0	6.4	0.95	150.6	70.9
7.000	50.00	5.51	46.899	0.075	0.0	0.0	1.0	1.16	184.2	11.2
7.001	50.00	5.82	46.782	0.083	0.0	0.0	1.1	1.07	170.8	12.4
1.007	49.54	8.52	46.743	1.019	0.0	0.0	13.7	1.00	159.7	150.4
1.008	46.51	9.66	46.581	1.019	0.0	0.0	13.7	0.95	151.6	150.4
8.000	50.00	5.51	46.990	0.116	0.0	0.0	1.6	1.00	159.4	17.3
8.001	50.00	5.64	46.914	0.116	0.0	0.0	1.6	1.01	160.6	17.3
8.002	50.00	6.17	46.895	0.232	0.0	0.0	3.1	1.00	159.3	34.6
8.003	50.00	7.08	46.816	0.331	0.0	0.0	4.5	1.00	159.5	49.3
8.004	50.00	7.31	46.681	0.432	0.0	0.0	5.8	1.01	160.4	64.3
8.005	50.00	7.98	46.647	0.484	0.0	0.0	6.6	1.00	159.6	72.1
8.006	48.97	8.73	46.547	0.484	0.0	0.0	6.6	1.01	159.9	72.1
9.000	50.00	5.28	46.892	0.094	0.0	0.0	1.3	1.01	160.1	14.0
9.001	50.00	5.43	46.850	0.094	0.0	0.0	1.3	1.01	160.3	14.0
9.002	50.00	5.97	46.828	0.130	0.0	0.0	1.8	1.01	160.5	19.4
9.003	50.00	6.35	46.747	0.161	0.0	0.0	2.2	1.00	159.3	24.0

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Network Design Table for Surface Network 1

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
9.004	15.993	0.039	410.1	0.075	0.00	0.0	0.600	o	450	Pipe/Conduit	
9.005	11.116	0.027	411.7	0.052	0.00	0.0	0.600	o	450	Pipe/Conduit	
9.006	26.445	0.065	406.8	0.047	0.00	0.0	0.600	o	450	Pipe/Conduit	
10.000	14.162	0.035	404.6	0.113	5.00	0.0	0.600	o	450	Pipe/Conduit	
10.001	11.148	0.028	398.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
10.002	35.923	0.089	403.6	0.102	0.00	0.0	0.600	o	450	Pipe/Conduit	
10.003	24.738	0.061	405.5	0.036	0.00	0.0	0.600	o	450	Pipe/Conduit	
10.004	9.062	0.022	411.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
10.005	25.946	0.064	405.4	0.019	0.00	0.0	0.600	o	450	Pipe/Conduit	
9.007	9.459	0.023	411.3	0.059	0.00	0.0	0.600	o	450	Pipe/Conduit	
9.008	39.971	0.099	403.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.009	34.291	0.137	250.3	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)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.004	50.00	6.62	46.691	0.236	0.0	0.0	3.2	1.00	158.7	35.2
9.005	50.00	6.80	46.652	0.288	0.0	0.0	3.9	1.00	158.4	42.9
9.006	50.00	7.24	46.625	0.335	0.0	0.0	4.5	1.00	159.3	49.9
10.000	50.00	5.23	46.858	0.113	0.0	0.0	1.5	1.00	159.8	16.8
10.001	50.00	5.42	46.823	0.113	0.0	0.0	1.5	1.01	161.1	16.8
10.002	50.00	6.01	46.795	0.215	0.0	0.0	2.9	1.01	160.0	32.0
10.003	50.00	6.42	46.706	0.251	0.0	0.0	3.4	1.00	159.6	37.4
10.004	50.00	6.58	46.645	0.251	0.0	0.0	3.4	1.00	158.3	37.4
10.005	50.00	7.01	46.622	0.270	0.0	0.0	3.7	1.00	159.6	40.2
9.007	50.00	7.40	46.558	0.664	0.0	0.0	9.0	1.00	158.4	98.9
9.008	50.00	8.06	46.535	0.664	0.0	0.0	9.0	1.01	159.9	98.9
1.009	45.13	10.24	46.436	2.167	0.0	0.0	26.5	0.99	69.9«	291.4

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	S8	48.000	46.299	0.000	1350	0

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Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	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)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.200	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S9, DS/PN: 1.009, Volume (m³): 25.4

Unit Reference	MD-SHE-0095-4700-1500-4700
Design Head (m)	1.500
Design Flow (l/s)	4.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	95
Invert Level (m)	46.436
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	4.7
Flush-Flo™	0.418	4.5
Kick-Flo®	0.848	3.6
Mean Flow over Head Range	-	4.0

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	3.1	1.200	4.2	3.000	6.5	7.000	9.7
0.200	4.1	1.400	4.5	3.500	7.0	7.500	10.0
0.300	4.4	1.600	4.8	4.000	7.4	8.000	10.3
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.6
0.500	4.5	2.000	5.4	5.000	8.3	9.000	10.9
0.600	4.4	2.200	5.6	5.500	8.6	9.500	11.2
0.800	3.9	2.400	5.8	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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Storage Structures for Surface Network 1

Tank or Pond Manhole: S109, DS/PN: 1.008

Invert Level (m) 46.581

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	367.0	1.000	1005.0

Tank or Pond Manhole: S9, DS/PN: 1.009

Invert Level (m) 46.436

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1363.0	1.000	2235.0

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
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, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S115	15 Winter	1	+0%	100/15 Summer			
1.001	S119	15 Winter	1	+0%	100/15 Summer			
1.002	S120	15 Winter	1	+0%	100/15 Summer			
1.003	S121	15 Winter	1	+0%	100/15 Summer			
1.004	S124	15 Winter	1	+0%	100/15 Summer			
2.000	S132	15 Winter	1	+0%	100/15 Summer			
2.001	S133	15 Winter	1	+0%	30/15 Winter			
2.002	S139	15 Winter	1	+0%	30/15 Winter			
2.003	S143	15 Winter	1	+0%	30/15 Summer			
1.005	S148	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
1.006	S149	15 Winter	1	+0%	30/15 Winter			
3.000	S153	15 Winter	1	+0%	100/15 Summer			
3.001	S155	15 Winter	1	+0%	30/15 Summer			
4.000	S161	15 Winter	1	+0%	100/15 Summer			
4.001	S162	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
3.002	S163	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
5.000	S167	15 Winter	1	+0%	100/15 Summer			
3.003	S168	15 Winter	1	+0%	30/15 Winter			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

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	S115	47.181	-0.361	0.000	0.06		6.3	OK	
1.001	S119	47.156	-0.351	0.000	0.08		8.0	OK	
1.002	S120	47.140	-0.344	0.000	0.10		13.8	OK	
1.003	S121	47.089	-0.316	0.000	0.10		14.6	OK	
1.004	S124	47.067	-0.261	0.000	0.13		16.8	OK	
2.000	S132	47.102	-0.343	0.000	0.08		10.2	OK	
2.001	S133	47.082	-0.314	0.000	0.08		9.8	OK	
2.002	S139	47.080	-0.305	0.000	0.14		19.4	OK	
2.003	S143	47.059	-0.236	0.000	0.14		16.2	OK	
1.005	S148	47.055	-0.221	0.000	0.43		39.3	OK	1
1.006	S149	47.027	-0.214	0.000	0.32		40.5	OK	
3.000	S153	47.546	-0.141	0.000	0.30		12.5	OK	
3.001	S155	47.100	-0.283	0.000	0.15		12.7	OK	
4.000	S161	47.264	-0.223	0.000	0.15		9.2	OK	
4.001	S162	47.187	-0.201	0.000	0.24		12.2	OK	3
3.002	S163	47.095	-0.264	0.000	0.24		33.1	OK	3
5.000	S167	47.183	-0.220	0.000	0.15		10.1	OK	
3.003	S168	47.058	-0.205	0.000	0.43		38.2	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
6.000	S171	15 Winter	1	+0%	100/15 Summer			
6.001	S172	15 Winter	1	+0%	100/15 Summer			
6.002	S173	15 Winter	1	+0%	100/15 Summer			
6.003	S174	15 Winter	1	+0%	30/15 Winter	100/15 Summer		
6.004	S178	15 Winter	1	+0%	30/15 Winter			
3.004	S179	15 Winter	1	+0%	30/15 Winter			
7.000	S184	15 Winter	1	+0%	100/15 Summer			
7.001	S185	15 Winter	1	+0%	30/15 Winter			
1.007	S6	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
1.008	S109	60 Winter	1	+0%	100/120 Winter			
8.000	S92	15 Winter	1	+0%	100/15 Summer			
8.001	S93	15 Winter	1	+0%	100/15 Summer			
8.002	S94	15 Winter	1	+0%	100/15 Summer			
8.003	S97	15 Winter	1	+0%	100/15 Summer			
8.004	S104	15 Winter	1	+0%	100/15 Summer			
8.005	S105	15 Winter	1	+0%	100/15 Summer			
8.006	S106	15 Winter	1	+0%	100/15 Summer			
9.000	S66	15 Winter	1	+0%	100/15 Summer			
9.001	S67	15 Winter	1	+0%	100/15 Summer			
9.002	S68	15 Winter	1	+0%	30/15 Winter			
9.003	S71	15 Winter	1	+0%	30/15 Winter			
9.004	S74	15 Winter	1	+0%	30/15 Summer			
9.005	S78	15 Winter	1	+0%	100/15 Summer			
9.006	S79	15 Winter	1	+0%	30/15 Summer			
10.000	S37	15 Winter	1	+0%	30/15 Winter			
10.001	S38	15 Winter	1	+0%	30/15 Summer			
10.002	S41	15 Winter	1	+0%	30/15 Summer			
10.003	S45	15 Winter	1	+0%	30/15 Summer			
10.004	S46	15 Winter	1	+0%	30/15 Summer			
10.005	S47	15 Winter	1	+0%	30/15 Summer			
9.007	S85	15 Winter	1	+0%	100/15 Summer			
9.008	S86	15 Winter	1	+0%	100/15 Summer			
1.009	S9	2160 Winter	1	+0%	30/60 Winter			

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
6.000	S171	47.409	-0.250	0.000	0.06		3.9	OK	
6.001	S172	47.353	-0.242	0.000	0.07		4.4	OK	
6.002	S173	47.307	-0.217	0.000	0.17		10.9	OK	
6.003	S174	47.159	-0.205	0.000	0.22		13.3	OK	4
6.004	S178	47.085	-0.200	0.000	0.24		13.6	OK	
3.004	S179	47.037	-0.200	0.000	0.44		50.6	OK	
7.000	S184	47.009	-0.340	0.000	0.06		10.0	OK	
7.001	S185	47.005	-0.227	0.000	0.04		5.7	OK	
1.007	S6	47.003	-0.190	0.000	0.61		91.7	OK	3
1.008	S109	46.736	-0.295	0.000	0.26		36.2	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

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
8.000	S92	47.108	-0.332	0.000	0.12		15.9	OK	
8.001	S93	47.058	-0.306	0.000	0.16		15.2	OK	
8.002	S94	47.044	-0.301	0.000	0.20		27.9	OK	
8.003	S97	46.977	-0.289	0.000	0.25		36.8	OK	
8.004	S104	46.889	-0.242	0.000	0.44		45.4	OK	
8.005	S105	46.832	-0.265	0.000	0.35		49.4	OK	
8.006	S106	46.728	-0.269	0.000	0.34		48.9	OK	
9.000	S66	47.004	-0.338	0.000	0.11		12.9	OK	
9.001	S67	46.968	-0.332	0.000	0.14		12.6	OK	
9.002	S68	46.947	-0.331	0.000	0.12		16.3	OK	
9.003	S71	46.900	-0.297	0.000	0.14		18.0	OK	
9.004	S74	46.881	-0.260	0.000	0.22		24.3	OK	
9.005	S78	46.865	-0.237	0.000	0.29		28.1	OK	
9.006	S79	46.852	-0.223	0.000	0.23		31.3	OK	
10.000	S37	46.989	-0.319	0.000	0.15		15.5	OK	
10.001	S38	46.959	-0.314	0.000	0.15		15.3	OK	
10.002	S41	46.939	-0.306	0.000	0.19		26.1	OK	
10.003	S45	46.884	-0.272	0.000	0.20		27.4	OK	
10.004	S46	46.860	-0.235	0.000	0.27		24.9	OK	
10.005	S47	46.850	-0.222	0.000	0.19		25.8	OK	
9.007	S85	46.824	-0.184	0.000	0.65		60.6	OK	
9.008	S86	46.739	-0.246	0.000	0.42		60.4	OK	
1.009	S9	46.709	-0.027	0.000	0.07		4.4	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
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, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S115	30 Winter	30	+0%	100/15 Summer			
1.001	S119	30 Winter	30	+0%	100/15 Summer			
1.002	S120	30 Winter	30	+0%	100/15 Summer			
1.003	S121	30 Winter	30	+0%	100/15 Summer			
1.004	S124	30 Winter	30	+0%	100/15 Summer			
2.000	S132	30 Winter	30	+0%	100/15 Summer			
2.001	S133	15 Winter	30	+0%	30/15 Winter			
2.002	S139	15 Winter	30	+0%	30/15 Winter			
2.003	S143	15 Winter	30	+0%	30/15 Summer			
1.005	S148	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
1.006	S149	15 Winter	30	+0%	30/15 Winter			
3.000	S153	15 Winter	30	+0%	100/15 Summer			
3.001	S155	15 Summer	30	+0%	30/15 Summer			
4.000	S161	15 Winter	30	+0%	100/15 Summer			
4.001	S162	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
3.002	S163	15 Summer	30	+0%	30/15 Summer	100/15 Winter		
5.000	S167	15 Winter	30	+0%	100/15 Summer			
3.003	S168	15 Winter	30	+0%	30/15 Winter			

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

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	S115	47.437	-0.105	0.000	0.11		11.8	OK	
1.001	S119	47.434	-0.073	0.000	0.14		13.1	OK	
1.002	S120	47.431	-0.053	0.000	0.18		25.4	OK	
1.003	S121	47.390	-0.015	0.000	0.17		24.2	OK	
1.004	S124	47.328	0.000	0.000	0.24		31.4	OK	
2.000	S132	47.445	0.000	0.000	0.15		19.0	OK	
2.001	S133	47.412	0.016	0.000	0.17		20.6	SURCHARGED	
2.002	S139	47.405	0.020	0.000	0.33		46.0	SURCHARGED	
2.003	S143	47.312	0.017	0.000	0.31		37.0	SURCHARGED	
1.005	S148	47.303	0.027	0.000	0.89		80.9	SURCHARGED	1
1.006	S149	47.285	0.044	0.000	0.60		75.1	SURCHARGED	
3.000	S153	47.606	-0.081	0.000	0.71		29.8	OK	
3.001	S155	47.385	0.002	0.000	0.30		26.5	SURCHARGED	
4.000	S161	47.454	-0.033	0.000	0.36		22.5	OK	
4.001	S162	47.412	0.024	0.000	0.58		29.7	SURCHARGED	3
3.002	S163	47.363	0.004	0.000	0.56		76.4	SURCHARGED	3
5.000	S167	47.339	-0.064	0.000	0.37		24.0	OK	
3.003	S168	47.316	0.053	0.000	0.91		80.2	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
6.000	S171	15 Winter	30	+0%	100/15 Summer			
6.001	S172	15 Winter	30	+0%	100/15 Summer			
6.002	S173	15 Winter	30	+0%	100/15 Summer			
6.003	S174	15 Winter	30	+0%	30/15 Winter	100/15 Summer		
6.004	S178	15 Winter	30	+0%	30/15 Winter			
3.004	S179	15 Winter	30	+0%	30/15 Winter			
7.000	S184	15 Winter	30	+0%	100/15 Summer			
7.001	S185	15 Winter	30	+0%	30/15 Winter			
1.007	S6	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
1.008	S109	2160 Winter	30	+0%	100/120 Winter			
8.000	S92	15 Winter	30	+0%	100/15 Summer			
8.001	S93	15 Winter	30	+0%	100/15 Summer			
8.002	S94	15 Winter	30	+0%	100/15 Summer			
8.003	S97	15 Winter	30	+0%	100/15 Summer			
8.004	S104	15 Winter	30	+0%	100/15 Summer			
8.005	S105	2160 Winter	30	+0%	100/15 Summer			
8.006	S106	2160 Winter	30	+0%	100/15 Summer			
9.000	S66	30 Winter	30	+0%	100/15 Summer			
9.001	S67	30 Winter	30	+0%	100/15 Summer			
9.002	S68	15 Winter	30	+0%	30/15 Winter			
9.003	S71	15 Winter	30	+0%	30/15 Winter			
9.004	S74	15 Summer	30	+0%	30/15 Summer			
9.005	S78	15 Winter	30	+0%	100/15 Summer			
9.006	S79	15 Summer	30	+0%	30/15 Summer			
10.000	S37	15 Winter	30	+0%	30/15 Winter			
10.001	S38	15 Winter	30	+0%	30/15 Summer			
10.002	S41	15 Winter	30	+0%	30/15 Summer			
10.003	S45	15 Summer	30	+0%	30/15 Summer			
10.004	S46	15 Winter	30	+0%	30/15 Summer			
10.005	S47	15 Winter	30	+0%	30/15 Summer			
9.007	S85	30 Summer	30	+0%	100/15 Summer			
9.008	S86	2160 Winter	30	+0%	100/15 Summer			
1.009	S9	2160 Winter	30	+0%	30/60 Winter			

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
6.000	S171	47.445	-0.214	0.000	0.16		9.5	OK	
6.001	S172	47.401	-0.194	0.000	0.19		11.4	OK	
6.002	S173	47.388	-0.136	0.000	0.47		30.8	OK	
6.003	S174	47.366	0.002	0.000	0.53		32.6	SURCHARGED	4
6.004	S178	47.319	0.034	0.000	0.52		29.7	SURCHARGED	
3.004	S179	47.296	0.059	0.000	0.86		98.4	SURCHARGED	
7.000	S184	47.295	-0.054	0.000	0.14		23.3	OK	
7.001	S185	47.262	0.030	0.000	0.14		19.1	SURCHARGED	
1.007	S6	47.257	0.064	0.000	1.17		175.3	SURCHARGED	3
1.008	S109	46.971	-0.060	0.000	0.06		8.9	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

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
8.000	S92	47.270	-0.170	0.000	0.28		38.5	OK	
8.001	S93	47.235	-0.129	0.000	0.42		39.2	OK	
8.002	S94	47.229	-0.116	0.000	0.51		71.1	OK	
8.003	S97	47.183	-0.083	0.000	0.62		90.8	OK	
8.004	S104	47.124	-0.007	0.000	1.00		104.0	OK	
8.005	S105	46.971	-0.126	0.000	0.05		6.6	OK	
8.006	S106	46.971	-0.026	0.000	0.04		6.4	OK	
9.000	S66	47.342	0.000	0.000	0.21		24.4	OK	
9.001	S67	47.300	0.000	0.000	0.21		19.8	OK	
9.002	S68	47.288	0.010	0.000	0.24		33.5	SURCHARGED	
9.003	S71	47.197	0.000	0.000	0.27		36.2	SURCHARGED	
9.004	S74	47.144	0.003	0.000	0.41		44.0	SURCHARGED	
9.005	S78	47.102	0.000	0.000	0.52		50.6	OK	
9.006	S79	47.083	0.008	0.000	0.45		61.1	SURCHARGED	
10.000	S37	47.315	0.007	0.000	0.36		37.5	SURCHARGED	
10.001	S38	47.303	0.030	0.000	0.33		32.6	SURCHARGED	
10.002	S41	47.264	0.019	0.000	0.44		62.4	SURCHARGED	
10.003	S45	47.163	0.007	0.000	0.39		52.3	SURCHARGED	
10.004	S46	47.104	0.009	0.000	0.63		57.7	SURCHARGED	
10.005	S47	47.089	0.017	0.000	0.44		58.9	SURCHARGED	
9.007	S85	47.008	0.000	0.000	1.10		102.5	OK	
9.008	S86	46.972	-0.013	0.000	0.06		8.5	OK	
1.009	S9	46.970	0.234	0.000	0.07		4.5	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
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, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S115	15 Winter	100	+40%	100/15 Summer			
1.001	S119	15 Winter	100	+40%	100/15 Summer			
1.002	S120	15 Winter	100	+40%	100/15 Summer			
1.003	S121	15 Winter	100	+40%	100/15 Summer			
1.004	S124	15 Winter	100	+40%	100/15 Summer			
2.000	S132	15 Winter	100	+40%	100/15 Summer			
2.001	S133	15 Winter	100	+40%	30/15 Winter			
2.002	S139	15 Winter	100	+40%	30/15 Winter			
2.003	S143	15 Winter	100	+40%	30/15 Summer			
1.005	S148	15 Winter	100	+40%	30/15 Summer	100/15 Winter		
1.006	S149	15 Winter	100	+40%	30/15 Winter			
3.000	S153	15 Winter	100	+40%	100/15 Summer			
3.001	S155	15 Winter	100	+40%	30/15 Summer			
4.000	S161	30 Winter	100	+40%	100/15 Summer			
4.001	S162	30 Winter	100	+40%	30/15 Summer	100/15 Winter		
3.002	S163	15 Winter	100	+40%	30/15 Summer	100/15 Winter		
5.000	S167	15 Winter	100	+40%	100/15 Summer			
3.003	S168	15 Winter	100	+40%	30/15 Winter			

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

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	S115	48.277	0.735	0.000	0.21		21.7	FLOOD RISK	
1.001	S119	48.269	0.762	0.000	0.26		25.6	FLOOD RISK	
1.002	S120	48.262	0.778	0.000	0.32		44.5	FLOOD RISK	
1.003	S121	48.236	0.831	0.000	0.38		52.6	FLOOD RISK	
1.004	S124	48.210	0.882	0.000	0.50		65.8	FLOOD RISK	
2.000	S132	48.260	0.815	0.000	0.28		36.8	FLOOD RISK	
2.001	S133	48.245	0.849	0.000	0.32		37.5	SURCHARGED	
2.002	S139	48.240	0.855	0.000	0.54		76.0	SURCHARGED	
2.003	S143	48.201	0.906	0.000	0.63		74.2	FLOOD RISK	
1.005	S148	48.181	0.905	0.294	1.86		168.9	FLOOD	1
1.006	S149	48.099	0.858	0.000	1.39		174.6	FLOOD RISK	
3.000	S153	48.611	0.924	0.000	1.07		44.9	FLOOD RISK	
3.001	S155	48.185	0.802	0.000	0.53		46.0	FLOOD RISK	
4.000	S161	48.314	0.827	0.000	0.43		27.2	FLOOD RISK	
4.001	S162	48.228	0.840	0.392	0.66		34.0	FLOOD	3
3.002	S163	48.170	0.811	2.674	0.80		108.8	FLOOD	3
5.000	S167	48.217	0.814	0.000	0.56		36.4	SURCHARGED	
3.003	S168	48.144	0.881	0.000	1.60		141.0	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
6.000	S171	15 Winter	100	+40%	100/15 Summer			
6.001	S172	15 Winter	100	+40%	100/15 Summer			
6.002	S173	30 Winter	100	+40%	100/15 Summer			
6.003	S174	30 Winter	100	+40%	30/15 Winter	100/15 Summer		
6.004	S178	30 Winter	100	+40%	30/15 Winter			
3.004	S179	15 Winter	100	+40%	30/15 Winter			
7.000	S184	15 Winter	100	+40%	100/15 Summer			
7.001	S185	15 Winter	100	+40%	30/15 Winter			
1.007	S6	15 Winter	100	+40%	30/15 Summer	100/15 Winter		
1.008	S109	2880 Winter	100	+40%	100/120 Winter			
8.000	S92	15 Winter	100	+40%	100/15 Summer			
8.001	S93	15 Winter	100	+40%	100/15 Summer			
8.002	S94	15 Winter	100	+40%	100/15 Summer			
8.003	S97	15 Winter	100	+40%	100/15 Summer			
8.004	S104	15 Winter	100	+40%	100/15 Summer			
8.005	S105	15 Winter	100	+40%	100/15 Summer			
8.006	S106	2880 Winter	100	+40%	100/15 Summer			
9.000	S66	15 Winter	100	+40%	100/15 Summer			
9.001	S67	15 Winter	100	+40%	100/15 Summer			
9.002	S68	15 Winter	100	+40%	30/15 Winter			
9.003	S71	15 Winter	100	+40%	30/15 Winter			
9.004	S74	15 Winter	100	+40%	30/15 Summer			
9.005	S78	15 Winter	100	+40%	100/15 Summer			
9.006	S79	15 Winter	100	+40%	30/15 Summer			
10.000	S37	15 Winter	100	+40%	30/15 Winter			
10.001	S38	15 Winter	100	+40%	30/15 Summer			
10.002	S41	15 Winter	100	+40%	30/15 Summer			
10.003	S45	15 Winter	100	+40%	30/15 Summer			
10.004	S46	15 Winter	100	+40%	30/15 Summer			
10.005	S47	15 Winter	100	+40%	30/15 Summer			
9.007	S85	15 Winter	100	+40%	100/15 Summer			
9.008	S86	2880 Winter	100	+40%	100/15 Summer			
1.009	S9	2880 Winter	100	+40%	30/60 Winter			

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
6.000	S171	48.286	0.627	0.000	0.26		15.3	SURCHARGED	
6.001	S172	48.273	0.678	0.000	0.30		18.0	SURCHARGED	
6.002	S173	48.260	0.736	0.000	0.51		33.4	FLOOD RISK	
6.003	S174	48.166	0.802	3.059	0.75		45.9	FLOOD	4
6.004	S178	48.146	0.861	0.000	0.87		49.5	FLOOD RISK	
3.004	S179	48.094	0.857	0.000	1.44		165.0	SURCHARGED	
7.000	S184	48.110	0.761	0.000	0.23		37.3	SURCHARGED	
7.001	S185	48.022	0.790	0.000	0.28		39.1	SURCHARGED	
1.007	S6	48.002	0.809	2.428	2.33		348.1	FLOOD	3
1.008	S109	47.364	0.333	0.000	0.13		18.4	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

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
8.000	S92	47.887	0.447	0.000	0.47		65.1	SURCHARGED	
8.001	S93	47.853	0.489	0.000	0.68		64.3	SURCHARGED	
8.002	S94	47.838	0.493	0.000	0.89		123.3	SURCHARGED	
8.003	S97	47.770	0.504	0.000	1.13		165.6	SURCHARGED	
8.004	S104	47.574	0.443	0.000	2.03		211.4	SURCHARGED	
8.005	S105	47.423	0.326	0.000	1.61		229.2	SURCHARGED	
8.006	S106	47.363	0.366	0.000	0.06		9.3	SURCHARGED	
9.000	S66	47.844	0.502	0.000	0.45		51.4	SURCHARGED	
9.001	S67	47.827	0.527	0.000	0.51		47.8	SURCHARGED	
9.002	S68	47.816	0.538	0.000	0.45		62.4	SURCHARGED	
9.003	S71	47.787	0.590	0.000	0.57		74.7	SURCHARGED	
9.004	S74	47.757	0.616	0.000	0.98		106.9	SURCHARGED	
9.005	S78	47.719	0.617	0.000	1.34		129.2	SURCHARGED	
9.006	S79	47.683	0.608	0.000	1.10		148.2	SURCHARGED	
10.000	S37	47.828	0.520	0.000	0.62		64.9	SURCHARGED	
10.001	S38	47.807	0.534	0.000	0.60		60.3	SURCHARGED	
10.002	S41	47.790	0.545	0.000	0.81		113.3	SURCHARGED	
10.003	S45	47.742	0.586	0.000	0.95		127.1	SURCHARGED	
10.004	S46	47.694	0.599	0.000	1.36		125.0	SURCHARGED	
10.005	S47	47.665	0.593	0.000	0.97		130.1	SURCHARGED	
9.007	S85	47.605	0.597	0.000	3.25		301.5	SURCHARGED	
9.008	S86	47.363	0.378	0.000	0.09		12.8	SURCHARGED	
1.009	S9	47.363	0.627	0.000	0.07		4.5	SURCHARGED	

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