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Science Park Square Brighton East Sussex	4501_Marmont_EastPreston Marmont Developments Ltd Proposed Calculations	
Date 20/05/2019	Designed by SD	
File 4501_MARMONT_EASTPRESTON_DRAINAGENETWORK.MDX	Checked by SB	
XP Solutions		Network 2018.1

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

« - 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	6.426	0.043	150.0	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	6.839	0.046	150.0	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	6.839	0.046	150.0	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	6.979	0.047	150.0	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	6.903	0.046	150.0	0.009	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	18.746	0.125	150.0	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.13	7.430	0.000	0.0	0.0	0.0	0.82	14.5	0.0
1.001	50.00	4.27	7.387	0.007	0.0	0.0	0.0	0.82	14.5	0.9
1.002	50.00	4.41	7.342	0.013	0.0	0.0	0.0	0.82	14.5	1.8
1.003	50.00	4.55	7.296	0.020	0.0	0.0	0.0	0.82	14.5	2.7
1.004	50.00	4.69	7.249	0.028	0.0	0.0	0.0	0.82	14.5	3.9
1.005	50.00	5.07	7.203	0.040	0.0	0.0	0.0	0.82	14.5	5.4

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STORM SEWER DESIGN by the Modified Rational Method											
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)	Section Type	Auto Design
2.000	13.912	0.093	150.0	0.004	4.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	5.470	0.036	150.0	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.002	13.458	0.090	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	22.616	0.151	150.0	0.003	4.00	0.0	0.600	o	150	Pipe/Conduit	
2.003	10.049	0.178	56.4	0.009	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	11.516	0.029	400.0	0.000	0.00	0.0	0.600	o	150	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)	
2.000	50.00	4.28	7.475	0.004	0.0	0.0	0.0	0.82	14.5	0.5	
2.001	50.00	4.39	7.382	0.012	0.0	0.0	0.0	0.82	14.5	1.6	
2.002	50.00	4.67	7.346	0.012	0.0	0.0	0.0	0.82	14.5	1.6	
3.000	50.00	4.46	7.570	0.003	0.0	0.0	0.0	0.82	14.5	0.4	
2.003	50.00	4.79	7.256	0.024	0.0	0.0	0.0	1.34	23.7	3.2	
1.006	50.00	5.46	7.078	0.063	0.0	0.0	0.0	0.50	8.8	8.6	
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STORM SEWER DESIGN by the Modified Rational Method

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)	Section Type	Auto Design
1.007	14.476	0.036	400.0	0.053	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.008	4.166	0.028	150.0	0.000	0.00	0.0	0.600	o	150	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)
1.007	50.00	5.95	7.049	0.116	0.0	0.0	0.0	0.50	8.8«	15.7
1.008	50.00	6.03	7.013	0.116	0.0	0.0	0.0	0.82	14.5«	15.7

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Area Summary for Storm						
Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
1.001	User	-	100	0.007	0.007	0.007
1.002	User	-	100	0.007	0.007	0.007
1.003	User	-	100	0.007	0.007	0.007
1.004	User	-	100	0.009	0.009	0.009
1.005	User	-	100	0.011	0.011	0.011
2.000	User	-	100	0.004	0.004	0.004
2.001	User	-	100	0.003	0.003	0.003
	User	-	100	0.004	0.004	0.007
	User	-	100	0.000	0.000	0.008
	User	-	100	0.001	0.001	0.008
2.002	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.003	0.003	0.003
2.003	User	-	100	0.009	0.009	0.009
1.006	-	-	100	0.000	0.000	0.000
1.007	User	-	100	0.004	0.004	0.004
	User	-	100	0.004	0.004	0.008
	User	-	100	0.004	0.004	0.013
	User	-	100	0.001	0.001	0.014
	User	-	100	0.001	0.001	0.016
	User	-	100	0.001	0.001	0.017
	User	-	100	0.001	0.001	0.018
	User	-	100	0.001	0.001	0.018
	User	-	100	0.001	0.001	0.019
	User	-	100	0.001	0.001	0.020
	User	-	100	0.001	0.001	0.021
	User	-	100	0.032	0.032	0.053
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XP Solutions	Network 2018.1																														
Area Summary for Storm <table><thead><tr><th>Pipe Number</th><th>PIMP Type</th><th>PIMP Name</th><th>PIMP (%)</th><th>Gross Area (ha)</th><th>Imp. Area (ha)</th><th>Pipe Total (ha)</th></tr></thead><tbody><tr><td>1.008</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td></td><td></td><td></td><td></td><td>Total</td><td>Total</td><td>Total</td></tr><tr><td></td><td></td><td></td><td></td><td>0.116</td><td>0.116</td><td>0.116</td></tr></tbody></table>				Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)	1.008	-	-	100	0.000	0.000	0.000					Total	Total	Total					0.116	0.116	0.116
Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)																									
1.008	-	-	100	0.000	0.000	0.000																									
				Total	Total	Total																									
				0.116	0.116	0.116																									
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Online Controls for Storm

Depth/Flow Relationship Manhole: 8, DS/PN: 1.008, Volume (m³): 0.6

Invert Level (m) 7.013

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	0.0000	1.200	0.0000	2.200	0.0000	3.200	0.0000	4.200	0.0000	5.200	0.0000
0.400	0.0000	1.400	0.0000	2.400	0.0000	3.400	0.0000	4.400	0.0000	5.400	0.0000
0.600	0.0000	1.600	0.0000	2.600	0.0000	3.600	0.0000	4.600	0.0000	5.600	0.0000
0.800	0.0000	1.800	0.0000	2.800	0.0000	3.800	0.0000	4.800	0.0000	5.800	0.0000
1.000	0.0000	2.000	0.0000	3.000	0.0000	4.000	0.0000	5.000	0.0000	6.000	0.0000

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XP Solutions		Network 2018.1																								
<u>Storage Structures for Storm</u> <u>Porous Car Park Manhole: PERMEABLE PAVING, DS/PN: 1.007</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.01515</td> <td>Porosity</td> <td>0.30</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Invert Level (m)</td> <td>6.592</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>152.8</td> <td>Width (m)</td> <td>25.0</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Length (m)</td> <td>22.0</td> <td>Membrane Depth (mm)</td> <td>0</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.01515	Porosity	0.30	Slope (1:X)	0.0	Membrane Percolation (mm/hr)	1000	Invert Level (m)	6.592	Depression Storage (mm)	5	Max Percolation (l/s)	152.8	Width (m)	25.0	Evaporation (mm/day)	3	Safety Factor	2.0	Length (m)	22.0	Membrane Depth (mm)	0
Infiltration Coefficient Base (m/hr)	0.01515	Porosity	0.30	Slope (1:X)	0.0																					
Membrane Percolation (mm/hr)	1000	Invert Level (m)	6.592	Depression Storage (mm)	5																					
Max Percolation (l/s)	152.8	Width (m)	25.0	Evaporation (mm/day)	3																					
Safety Factor	2.0	Length (m)	22.0	Membrane Depth (mm)	0																					
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<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>																																									
<u>Simulation Criteria</u>																																									
Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000																																									
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800																																									
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000																																									
Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0																																									
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0																																									
<u>Synthetic Rainfall Details</u>																																									
Rainfall Model FEH Site Location GB 506868 102558 Cv (Summer) 0.750																																									
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840																																									
Margin for Flood Risk Warning (mm) 0.0 DVD Status ON																																									
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON																																									
DTS Status ON																																									
<u>Profile(s)</u>																																									
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) 2, 30, 100																																									
Climate Change (%) 40, 40, 40																																									
<table><tr><th colspan="2">US/MH</th><th rowspan="2">Event</th><th rowspan="2">Duration (mins)</th><th rowspan="2">Storm Rank</th><th rowspan="2">US/CL (m)</th><th colspan="2">Water Surcharged</th><th rowspan="2">Flow / Cap.</th><th rowspan="2">Maximum Vol (m³)</th><th rowspan="2">Discharge Vol (m³)</th><th rowspan="2">Pipe Flow (l/s)</th><th rowspan="2">Status</th></tr><tr><th>PN</th><th>Name</th><th>Level (m)</th><th>Depth (m)</th></tr><tr><td>1.000</td><td>1</td><td>360 minute 2 year Winter I+40%</td><td>360</td><td>1</td><td>8.180</td><td>7.430</td><td>-0.150</td><td>0.00</td><td>0.000</td><td>0.000</td><td>0.0</td><td>OK</td></tr></table>												US/MH		Event	Duration (mins)	Storm Rank	US/CL (m)	Water Surcharged		Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status	PN	Name	Level (m)	Depth (m)	1.000	1	360 minute 2 year Winter I+40%	360	1	8.180	7.430	-0.150	0.00	0.000	0.000	0.0	OK
US/MH		Event	Duration (mins)	Storm Rank	US/CL (m)	Water Surcharged		Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status																													
PN	Name					Level (m)	Depth (m)																																		
1.000	1	360 minute 2 year Winter I+40%	360	1	8.180	7.430	-0.150	0.00	0.000	0.000	0.0	OK																													
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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm														
PN	US/MH Name	Event	Duration (mins)	Storm Rank	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status		
1.001		2 15 minute 2 year Winter I+40%	15	1	8.180	7.420	-0.117	0.11	0.023	0.750	1.4	OK		
1.002		3 15 minute 2 year Winter I+40%	15	1	8.180	7.390	-0.102	0.22	0.037	1.499	2.7	OK		
1.003		4 15 minute 2 year Winter I+40%	15	1	8.180	7.356	-0.090	0.33	0.047	2.253	4.1	OK		
1.004		5 15 minute 2 year Winter I+40%	15	1	8.500	7.330	-0.069	0.47	0.065	3.234	5.8	OK		
1.005		6 15 minute 2 year Winter I+40%	15	1	8.550	7.314	-0.039	0.58	0.091	4.498	7.9	OK		
2.000		13 15 minute 2 year Winter I+40%	15	1	8.225	7.501	-0.124	0.07	0.006	0.400	0.9	OK		
2.001		12 15 minute 2 year Winter I+40%	15	1	8.200	7.430	-0.102	0.22	0.046	1.362	2.7	OK		
2.002		11 15 minute 2 year Winter I+40%	15	1	8.180	7.391	-0.104	0.20	0.031	1.362	2.7	OK		
3.000		9 15 minute 2 year Winter I+40%	15	1	8.320	7.593	-0.127	0.05	0.005	0.328	0.8	OK		
2.003		10 15 minute 2 year Winter I+40%	15	1	8.200	7.307	-0.100	0.24	0.048	2.680	5.2	OK		
1.006		7 15 minute 2 year Winter I+40%	15	1	8.250	7.270	0.042	1.69	0.413	7.170	13.0	SURCHARGED		
1.007	PERMEABLE PAVING	360 minute 2 year Winter I+40%	360	1	8.200	6.728	-0.471	0.00	22.517	0.000	0.0	OK		
1.008		8 360 minute 2 year Winter I+40%	360	1	8.200	7.013	-0.150	0.00	0.000	0.000	0.0	OK		
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
 Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
 Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 506868 102558 Cv (Summer) 0.750
 FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 0.0 DVD Status ON
 Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON
 DTS Status ON

Profile(s)

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) 2, 30, 100
 Climate Change (%) 40, 40, 40

PN	US/MH Name	Event	Duration (mins)	Storm Rank	US/CL (m)	Water Surcharged			Pipe			Status
						Level (m)	Depth (m)	Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Flow (l/s)	
1.000	1	15 minute 30 year Winter I+40%	15	1	8.180	7.854	0.274	0.05	0.119	0.001	0.6	SURCHARGED

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm														
PN	US/MH Name	Event			Duration (mins)	Storm Rank	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.001		2	15 minute	30 year Winter I+40%	15	1	8.180	7.855	0.318	0.25	0.234	1.663	3.1	SURCHARGED
1.002		3	15 minute	30 year Winter I+40%	15	1	8.180	7.848	0.356	0.49	0.252	3.326	6.0	SURCHARGED
1.003		4	15 minute	30 year Winter I+40%	15	1	8.180	7.833	0.387	0.72	0.261	4.997	8.9	SURCHARGED
1.004		5	15 minute	30 year Winter I+40%	15	1	8.500	7.809	0.409	1.02	0.269	7.175	12.6	SURCHARGED
1.005		6	15 minute	30 year Winter I+40%	15	1	8.550	7.758	0.405	1.30	0.267	9.982	17.7	SURCHARGED
2.000		13	15 minute	30 year Winter I+40%	15	1	8.225	7.612	-0.013	0.14	0.037	0.887	1.9	OK
2.001		12	15 minute	30 year Winter I+40%	15	1	8.200	7.606	0.073	0.45	0.288	3.022	5.4	SURCHARGED
2.002		11	15 minute	30 year Winter I+40%	15	1	8.180	7.594	0.098	0.41	0.155	3.022	5.5	SURCHARGED
3.000		9	15 minute	30 year Winter I+40%	15	1	8.320	7.605	-0.115	0.12	0.008	0.727	1.7	OK
2.003		10	15 minute	30 year Winter I+40%	15	1	8.200	7.573	0.166	0.47	0.499	5.943	9.9	SURCHARGED
1.006		7	15 minute	30 year Winter I+40%	15	1	8.250	7.535	0.307	3.54	0.616	15.928	27.2	SURCHARGED
1.007	PERMEABLE PAVING	240	minute	30 year Winter I+40%	240	1	8.200	6.908	-0.291	0.00	52.194	0.000	0.0	OK
1.008		8	360 minute	30 year Winter I+40%	360	1	8.200	7.013	-0.150	0.00	0.000	0.000	0.0	OK
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XP Solutions		Network 2018.1

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
 Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coefficient 0.800
 Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 506868 102558 Cv (Summer) 0.750
 FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 0.0 DVD Status ON
 Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON
 DTS Status ON

Profile(s)

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) 2, 30, 100
 Climate Change (%) 40, 40, 40

PN	US/MH Name	Event	Duration (mins)	Storm Rank	US/CL (m)	Water Surcharged			Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
						Level (m)	Depth (m)						
1.000	1	15 minute 100 year Winter I+40%	15	1	8.180	8.165	0.585	0.07	0.206	0.001	0.8	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm														
PN	US/MH Name	Event	Duration (mins)	Storm Rank	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flow / Cap.	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status		
1.001		2 15 minute 100 year Winter I+40%	15	1	8.180	8.166	0.629	0.32	0.322	2.110	4.0	SURCHARGED		
1.002		3 15 minute 100 year Winter I+40%	15	1	8.180	8.158	0.666	0.59	0.340	4.219	7.3	SURCHARGED		
1.003		4 15 minute 100 year Winter I+40%	15	1	8.180	8.139	0.693	0.87	0.347	6.339	10.7	SURCHARGED		
1.004		5 15 minute 100 year Winter I+40%	15	1	8.500	8.105	0.706	1.23	0.353	9.101	15.2	SURCHARGED		
1.005		6 15 minute 100 year Winter I+40%	15	1	8.550	8.034	0.681	1.57	0.345	12.663	21.3	SURCHARGED		
2.000		13 15 minute 100 year Winter I+40%	15	1	8.225	7.827	0.202	0.15	0.098	1.125	2.0	SURCHARGED		
2.001		12 15 minute 100 year Winter I+40%	15	1	8.200	7.820	0.288	0.57	0.358	3.832	6.8	SURCHARGED		
2.002		11 15 minute 100 year Winter I+40%	15	1	8.180	7.806	0.311	0.48	0.215	3.832	6.3	SURCHARGED		
3.000		9 15 minute 100 year Winter I+40%	15	1	8.320	7.789	0.069	0.14	0.060	0.922	2.0	SURCHARGED		
2.003		10 15 minute 100 year Winter I+40%	15	1	8.200	7.782	0.375	0.58	0.763	7.537	12.2	SURCHARGED		
1.006		7 15 minute 100 year Winter I+40%	15	1	8.250	7.716	0.488	4.36	0.667	20.202	33.5	SURCHARGED		
1.007	PERMEABLE PAVING	360 minute 100 year Winter I+40%	360	1	8.200	7.006	-0.193	0.00	68.393	0.000	0.0	OK		
1.008		8 360 minute 100 year Winter I+40%	360	1	8.200	7.013	-0.150	0.00	0.000	0.000	0.0	OK		
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