Horganlynch Consulting Engineers		Page 1
Tellengana Blackrock Road Cork	SCHOLARSTOWN APARTMENTS DUBLIN	
Date 29/09/2022 File CL12 - SUDs System Calcu...	Designed by JG Checked by KC	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	PIMP (%)	95
M5-60 (mm)	16.600	Add Flow / Climate Change (%)	20
Ratio R	0.300	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	2.000
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

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
S1.000	3.000	0.015	200.0	0.004	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	15.286	0.076	200.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	10.406	0.083	125.0	0.026	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	12.578	0.070	179.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	11.854	0.059	200.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	8.273	0.041	201.8	0.026	5.00	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)
S1.000	50.00	5.07	85.700	0.004	0.0	0.0	0.1	0.71	12.5	0.6
S1.001	50.00	5.43	85.685	0.004	0.0	0.0	0.1	0.71	12.5	0.6
S2.000	50.00	5.19	85.700	0.026	0.0	0.0	0.7	0.90	15.9	4.1
S1.002	50.00	5.71	85.609	0.029	0.0	0.0	0.8	0.75	13.2	4.8
S1.003	50.00	5.99	85.539	0.029	0.0	0.0	0.8	0.71	12.5	4.8
S3.000	50.00	5.20	85.650	0.026	0.0	0.0	0.7	0.70	12.4	4.1

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
S1.004	13.855	0.069	200.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	14.670	0.073	201.0	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	7.269	0.036	201.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	10.818	0.107	100.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.000	10.535	0.105	100.3	0.008	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.008	36.411	0.182	200.0	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	11.439	0.057	200.7	0.006	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.009	26.223	0.175	149.8	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	5.919	0.039	150.0	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.010	47.348	0.316	149.8	0.086	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	5.407	0.054	100.1	0.012	5.00	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)
S1.004	50.00	6.32	85.480	0.055	0.0	0.0	1.5	0.71	12.5	8.9
S1.005	50.00	6.67	85.411	0.068	0.0	0.0	1.8	0.71	12.5	11.1
S1.006	50.00	6.84	85.338	0.068	0.0	0.0	1.8	0.70	12.4	11.1
S1.007	50.00	7.02	85.302	0.068	0.0	0.0	1.8	1.00	17.7	11.1
S4.000	50.00	5.13	85.300	0.008	0.0	0.0	0.2	1.31	51.9	1.3
S1.008	50.00	7.68	85.195	0.115	0.0	0.0	3.1	0.92	36.6	18.7
S5.000	50.00	5.21	85.200	0.006	0.0	0.0	0.2	0.92	36.6	1.0
S1.009	50.00	8.09	85.013	0.149	0.0	0.0	4.0	1.07	42.4	24.2
S6.000	50.00	5.12	85.000	0.013	0.0	0.0	0.4	0.82	14.5	2.2
S1.010	50.00	8.83	84.838	0.248	0.0	0.0	6.7	1.07	42.4	40.3
S7.000	50.00	5.09	85.000	0.012	0.0	0.0	0.3	1.00	17.7	2.0

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
S1.011	20.570	0.137	150.1	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	9.187	0.061	150.0	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit	
S8.001	10.523	0.070	150.3	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S9.000	5.151	0.026	200.0	0.009	5.00	0.0	0.600	o	150	Pipe/Conduit	
S8.002	10.750	0.072	149.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S8.003	8.146	0.054	150.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S10.000	3.006	0.030	100.2	0.006	5.00	0.0	0.600	o	150	Pipe/Conduit	
S8.004	9.853	0.066	149.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.012	3.326	0.022	151.2	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)
S1.011	50.00	9.10	84.522	0.269	0.0	0.0	7.3	1.28	90.5	43.7
S8.000	50.00	5.24	85.650	0.005	0.0	0.0	0.1	0.63	4.9	0.8
S8.001	50.00	5.53	85.604	0.005	0.0	0.0	0.1	0.62	4.9	0.8
S9.000	50.00	5.12	85.650	0.009	0.0	0.0	0.3	0.71	12.5	1.5
S8.002	50.00	5.74	85.534	0.014	0.0	0.0	0.4	0.82	14.5	2.3
S8.003	50.00	5.91	85.462	0.014	0.0	0.0	0.4	0.82	14.4	2.3
S10.000	50.00	5.05	85.650	0.006	0.0	0.0	0.2	1.00	17.7	0.9
S8.004	50.00	6.11	85.408	0.020	0.0	0.0	0.5	0.82	14.5	3.3
S1.012	50.00	9.16	84.420	0.289	0.0	0.0	7.8	0.81	14.4«	46.9

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	86.000	0.300	Open Manhole	1200	S1.000	85.700	150				
S1	86.000	0.315	Open Manhole	1200	S1.001	85.685	150	S1.000	85.685	150	
S4	86.000	0.300	Open Manhole	1200	S2.000	85.700	150				
S2	86.000	0.391	Open Manhole	1200	S1.002	85.609	150	S1.001	85.609	150	
								S2.000	85.617	150	8
S3	86.000	0.461	Open Manhole	1200	S1.003	85.539	150	S1.002	85.539	150	
S6	86.000	0.350	Open Manhole	1200	S3.000	85.650	150				
S4	86.000	0.520	Open Manhole	1200	S1.004	85.480	150	S1.003	85.480	150	
								S3.000	85.609	150	129
S5	86.000	0.589	Open Manhole	1200	S1.005	85.411	150	S1.004	85.411	150	
S10	86.000	0.662	Open Manhole	1200	S1.006	85.338	150	S1.005	85.338	150	
S6	86.000	0.698	Open Manhole	1200	S1.007	85.302	150	S1.006	85.302	150	
S10	86.300	1.000	Open Manhole	1200	S4.000	85.300	225				
S7	86.000	0.805	Open Manhole	1200	S1.008	85.195	225	S1.007	85.195	150	
								S4.000	85.195	225	
S12	86.000	0.800	Open Manhole	1200	S5.000	85.200	225				
S8	86.000	0.987	Open Manhole	1200	S1.009	85.013	225	S1.008	85.013	225	
								S5.000	85.143	225	130
S14	86.000	1.000	Open Manhole	1200	S6.000	85.000	150				
S9	86.000	1.162	Open Manhole	1200	S1.010	84.838	225	S1.009	84.838	225	
								S6.000	84.961	150	48
S16	86.000	1.000	Open Manhole	1200	S7.000	85.000	150				
S10	86.000	1.478	Open Manhole	1200	S1.011	84.522	300	S1.010	84.522	225	
								S7.000	84.946	150	274
S18	86.000	0.350	Open Manhole	1200	S8.000	85.650	100				
S18	86.000	0.411	Open Manhole	1200	S8.001	85.604	100	S8.000	85.589	100	
S20	86.000	0.350	Open Manhole	1200	S9.000	85.650	150				
S19	86.000	0.466	Open Manhole	1200	S8.002	85.534	150	S8.001	85.534	100	
								S9.000	85.624	150	90
S23	86.000	0.538	Open Manhole	1200	S8.003	85.462	150	S8.002	85.462	150	
S22	86.000	0.350	Open Manhole	1200	S10.000	85.650	150				
S20	86.000	0.592	Open Manhole	1200	S8.004	85.408	150	S8.003	85.408	150	
								S10.000	85.620	150	212
S11	86.000	1.615	Open Manhole	1200	S1.012	84.420	150	S1.011	84.385	300	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								S8.004	85.342	150	922
S	86.000	1.602	Open Manhole	0		OUTFALL		S1.012	84.398	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	712249.794	726749.208	712249.794	726749.208	Required	
S1	712252.595	726750.284	712252.595	726750.284	Required	
S4	712254.871	726726.334	712254.871	726726.334	Required	
S2	712258.375	726736.133	712258.375	726736.133	Required	
S3	712270.844	726737.782	712270.844	726737.782	Required	
S6	712285.303	726732.859	712285.303	726732.859	Required	
S4	712282.361	726740.591	712282.361	726740.591	Required	
S5	712285.458	726754.095	712285.458	726754.095	Required	
S10	712300.094	726755.088	712300.094	726755.088	Required	
S6	712307.233	726756.461	712307.233	726756.461	Required	
S10	712309.856	726749.104	712309.856	726749.104	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S7	712318.027	726755.754	712318.027	726755.754	Required	
S12	712309.484	726729.654	712309.484	726729.654	Required	
S8	712314.737	726719.492	712314.737	726719.492	Required	
S14	712289.561	726717.583	712289.561	726717.583	Required	
S9	712289.710	726711.666	712289.710	726711.666	Required	
S16	712246.226	726702.541	712246.226	726702.541	Required	
S10	712244.563	726697.395	712244.563	726697.395	Required	
S18	712236.278	726744.471	712236.278	726744.471	Required	
S18	712234.309	726735.498	712234.309	726735.498	Required	
S20	712236.127	726728.440	712236.127	726728.440	Required	
S19	712232.118	726725.206	712232.118	726725.206	Required	
S23	712229.537	726714.770	712229.537	726714.770	Required	
S22	712232.403	726706.512	712232.403	726706.512	Required	
S20	712229.399	726706.626	712229.399	726706.626	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S11	712224.017	726698.374	712224.017	726698.374	Required	
S	712220.714	726697.985			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	86.000	85.700	0.150	Open Manhole	1200
S1.001	o	150	S1	86.000	85.685	0.165	Open Manhole	1200
S2.000	o	150	S4	86.000	85.700	0.150	Open Manhole	1200
S1.002	o	150	S2	86.000	85.609	0.241	Open Manhole	1200
S1.003	o	150	S3	86.000	85.539	0.311	Open Manhole	1200
S3.000	o	150	S6	86.000	85.650	0.200	Open Manhole	1200
S1.004	o	150	S4	86.000	85.480	0.370	Open Manhole	1200
S1.005	o	150	S5	86.000	85.411	0.439	Open Manhole	1200
S1.006	o	150	S10	86.000	85.338	0.512	Open Manhole	1200
S1.007	o	150	S6	86.000	85.302	0.548	Open Manhole	1200
S4.000	o	225	S10	86.300	85.300	0.775	Open Manhole	1200
S1.008	o	225	S7	86.000	85.195	0.580	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	3.000	200.0	S1	86.000	85.685	0.165	Open Manhole	1200
S1.001	15.286	200.0	S2	86.000	85.609	0.241	Open Manhole	1200
S2.000	10.406	125.0	S2	86.000	85.617	0.233	Open Manhole	1200
S1.002	12.578	179.7	S3	86.000	85.539	0.311	Open Manhole	1200
S1.003	11.854	200.9	S4	86.000	85.480	0.370	Open Manhole	1200
S3.000	8.273	201.8	S4	86.000	85.609	0.241	Open Manhole	1200
S1.004	13.855	200.8	S5	86.000	85.411	0.439	Open Manhole	1200
S1.005	14.670	201.0	S10	86.000	85.338	0.512	Open Manhole	1200
S1.006	7.269	201.9	S6	86.000	85.302	0.548	Open Manhole	1200
S1.007	10.818	100.8	S7	86.000	85.195	0.655	Open Manhole	1200
S4.000	10.535	100.3	S7	86.000	85.195	0.580	Open Manhole	1200
S1.008	36.411	200.0	S8	86.000	85.013	0.762	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.000	o	225	S12	86.000	85.200	0.575	Open Manhole	1200
S1.009	o	225	S8	86.000	85.013	0.762	Open Manhole	1200
S6.000	o	150	S14	86.000	85.000	0.850	Open Manhole	1200
S1.010	o	225	S9	86.000	84.838	0.937	Open Manhole	1200
S7.000	o	150	S16	86.000	85.000	0.850	Open Manhole	1200
S1.011	o	300	S10	86.000	84.522	1.178	Open Manhole	1200
S8.000	o	100	S18	86.000	85.650	0.250	Open Manhole	1200
S8.001	o	100	S18	86.000	85.604	0.296	Open Manhole	1200
S9.000	o	150	S20	86.000	85.650	0.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.000	11.439	200.7	S8	86.000	85.143	0.632	Open Manhole	1200
S1.009	26.223	149.8	S9	86.000	84.838	0.937	Open Manhole	1200
S6.000	5.919	150.0	S9	86.000	84.961	0.889	Open Manhole	1200
S1.010	47.348	149.8	S10	86.000	84.522	1.253	Open Manhole	1200
S7.000	5.407	100.1	S10	86.000	84.946	0.904	Open Manhole	1200
S1.011	20.570	150.1	S11	86.000	84.385	1.315	Open Manhole	1200
S8.000	9.187	150.0	S18	86.000	85.589	0.311	Open Manhole	1200
S8.001	10.523	150.3	S19	86.000	85.534	0.366	Open Manhole	1200
S9.000	5.151	200.0	S19	86.000	85.624	0.226	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S8.002	o	150	S19	86.000	85.534	0.316	Open Manhole	1200
S8.003	o	150	S23	86.000	85.462	0.388	Open Manhole	1200
S10.000	o	150	S22	86.000	85.650	0.200	Open Manhole	1200
S8.004	o	150	S20	86.000	85.408	0.442	Open Manhole	1200
S1.012	o	150	S11	86.000	84.420	1.430	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S8.002	10.750	149.3	S23	86.000	85.462	0.388	Open Manhole	1200
S8.003	8.146	150.9	S20	86.000	85.408	0.442	Open Manhole	1200
S10.000	3.006	100.2	S20	86.000	85.620	0.230	Open Manhole	1200
S8.004	9.853	149.3	S11	86.000	85.342	0.508	Open Manhole	1200
S1.012	3.326	151.2	S	86.000	84.398	1.452	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Green Roof	70	0.006	0.004	0.004
1.001	-	-	95	0.000	0.000	0.000
2.000	Classification	Green Roof	70	0.036	0.026	0.026
1.002	-	-	95	0.000	0.000	0.000
1.003	-	-	95	0.000	0.000	0.000
3.000	Classification	Green Roof	70	0.036	0.026	0.026
1.004	-	-	95	0.000	0.000	0.000
1.005	Classification	Permeable Pavement	95	0.014	0.013	0.013
1.006	-	-	95	0.000	0.000	0.000
1.007	-	-	95	0.000	0.000	0.000
4.000	Classification	Green Roof	70	0.012	0.008	0.008
1.008	Classification	Permeable Pavement	95	0.040	0.038	0.038
5.000	Classification	Green Roof	70	0.009	0.006	0.006
1.009	Classification	Permeable Pavement	95	0.029	0.028	0.028
6.000	Classification	Green Roof	70	0.019	0.013	0.013
1.010	-	-	95	0.090	0.086	0.086
7.000	-	-	95	0.013	0.012	0.012
1.011	-	-	95	0.009	0.009	0.009
8.000	Classification	Green Roof	70	0.007	0.005	0.005
8.001	-	-	95	0.000	0.000	0.000
9.000	Classification	Green Roof	70	0.013	0.009	0.009
8.002	-	-	95	0.000	0.000	0.000
8.003	-	-	95	0.000	0.000	0.000
10.000	-	-	95	0.006	0.006	0.006
8.004	-	-	95	0.000	0.000	0.000
1.012	-	-	95	0.000	0.000	0.000
				Total	Total	Total
				0.340	0.289	0.289

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S1.000	S1	150	0.150	0.165	Unclassified	1200	0	0.150	Unclassified
S1.001	S1	150	0.165	0.241	Unclassified	1200	0	0.165	Unclassified
S2.000	S4	150	0.150	0.233	Unclassified	1200	0	0.150	Unclassified
S1.002	S2	150	0.241	0.311	Unclassified	1200	0	0.241	Unclassified
S1.003	S3	150	0.311	0.370	Unclassified	1200	0	0.311	Unclassified
S3.000	S6	150	0.200	0.241	Unclassified	1200	0	0.200	Unclassified
S1.004	S4	150	0.370	0.439	Unclassified	1200	0	0.370	Unclassified
S1.005	S5	150	0.439	0.512	Unclassified	1200	0	0.439	Unclassified
S1.006	S10	150	0.512	0.548	Unclassified	1200	0	0.512	Unclassified
S1.007	S6	150	0.548	0.655	Unclassified	1200	0	0.548	Unclassified
S4.000	S10	225	0.580	0.775	Unclassified	1200	0	0.775	Unclassified
S1.008	S7	225	0.580	0.762	Unclassified	1200	0	0.580	Unclassified
S5.000	S12	225	0.575	0.632	Unclassified	1200	0	0.575	Unclassified
S1.009	S8	225	0.762	0.937	Unclassified	1200	0	0.762	Unclassified
S6.000	S14	150	0.850	0.889	Unclassified	1200	0	0.850	Unclassified
S1.010	S9	225	0.937	1.253	Unclassified	1200	0	0.937	Unclassified
S7.000	S16	150	0.850	0.904	Unclassified	1200	0	0.850	Unclassified
S1.011	S10	300	1.178	1.315	Unclassified	1200	0	1.178	Unclassified
S8.000	S18	100	0.250	0.311	Unclassified	1200	0	0.250	Unclassified
S8.001	S18	100	0.296	0.366	Unclassified	1200	0	0.296	Unclassified
S9.000	S20	150	0.200	0.226	Unclassified	1200	0	0.200	Unclassified
S8.002	S19	150	0.316	0.388	Unclassified	1200	0	0.316	Unclassified
S8.003	S23	150	0.388	0.442	Unclassified	1200	0	0.388	Unclassified
S10.000	S22	150	0.200	0.230	Unclassified	1200	0	0.200	Unclassified
S8.004	S20	150	0.442	0.508	Unclassified	1200	0	0.442	Unclassified
S1.012	S11	150	1.430	1.452	Unclassified	1200	0	1.430	Unclassified

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 5 Number of Storage Structures 8 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region Scotland and Ireland
Return Period (years) 100 M5-60 (mm) 17.000

Synthetic Rainfall Details

Ratio R	0.300	Cv (Winter)	0.840
Profile Type	Summer	Storm Duration (mins)	30
Cv (Summer)	0.750		

Online Controls for Storm

Orifice Manhole: S3, DS/PN: S1.003, Volume (m³): 0.7

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 85.539

Orifice Manhole: S10, DS/PN: S1.006, Volume (m³): 1.0

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 85.338

Orifice Manhole: S19, DS/PN: S8.002, Volume (m³): 0.7

Diameter (m) 0.029 Discharge Coefficient 0.600 Invert Level (m) 85.534

Orifice Manhole: S20, DS/PN: S8.004, Volume (m³): 0.8

Diameter (m) 0.021 Discharge Coefficient 0.600 Invert Level (m) 85.408

Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.012, Volume (m³): 3.3

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	84.420
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0	Kick-Flo®	0.573	1.4
Flush-Flo™	0.282	1.8	Mean Flow over Head Range	-	1.6

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	1.5	0.500	1.6	1.200	2.0	2.000	2.5
0.200	1.7	0.600	1.5	1.400	2.1	2.200	2.6
0.300	1.8	0.800	1.7	1.600	2.3	2.400	2.7
0.400	1.7	1.000	1.8	1.800	2.4	2.600	2.8

Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.012, Volume (m³): 3.3

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
3.000	3.0	5.000	3.9	7.000	4.5	9.000	5.1
3.500	3.3	5.500	4.0	7.500	4.7	9.500	5.2
4.000	3.5	6.000	4.2	8.000	4.8		
4.500	3.7	6.500	4.4	8.500	5.0		

Storage Structures for Storm

Infiltration Basin Manhole: S3, DS/PN: S1.003

Invert Level (m)	85.660	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	1.00
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	6.5	0.340	36.0

Infiltration Basin Manhole: S10, DS/PN: S1.006

Invert Level (m)	85.500	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	1.00
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	80.0	0.500	156.0

Porous Car Park Manhole: S10, DS/PN: S1.011

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.0
Membrane Percolation (mm/hr)	1000	Length (m)	140.0
Max Percolation (l/s)	311.1	Slope (1:X)	1100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	85.300	Cap Volume Depth (m)	0.300

Swale Manhole: S18, DS/PN: S8.000

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	8.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	150.0
Porosity	1.00	Cap Volume Depth (m)	0.300
Invert Level (m)	85.650	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0	Include Swale Volume	Yes

Swale Manhole: S18, DS/PN: S8.001

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Swale Manhole: S18, DS/PN: S8.001

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	8.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	150.0
Porosity	1.00	Cap Volume Depth (m)	0.300
Invert Level (m)	85.604	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0	Include Swale Volume	Yes

Swale Manhole: S19, DS/PN: S8.002

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	8.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	150.0
Porosity	1.00	Cap Volume Depth (m)	0.300
Invert Level (m)	85.534	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0	Include Swale Volume	Yes

Swale Manhole: S23, DS/PN: S8.003

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	8.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	150.0
Porosity	1.00	Cap Volume Depth (m)	0.300
Invert Level (m)	85.462	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0	Include Swale Volume	Yes

Swale Manhole: S20, DS/PN: S8.004

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	5.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	150.0
Porosity	1.00	Cap Volume Depth (m)	0.300
Invert Level (m)	85.408	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0	Include Swale Volume	Yes

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	20.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 5 Number of Storage Structures 8 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.282
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.600	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	75.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
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
Return Period(s) (years)	100
Climate Change (%)	20

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	120 Winter	100	+20%	100/15 Summer				85.970
S1.001	S1	120 Winter	100	+20%	100/15 Summer				85.969
S2.000	S4	120 Winter	100	+20%	100/15 Summer				85.973
S1.002	S2	120 Winter	100	+20%	100/15 Summer				85.969
S1.003	S3	120 Winter	100	+20%	100/15 Summer				85.964
S3.000	S6	600 Winter	100	+20%	100/15 Winter				85.822
S1.004	S4	600 Winter	100	+20%	100/15 Summer				85.822
S1.005	S5	600 Winter	100	+20%	100/15 Summer				85.820
S1.006	S10	600 Winter	100	+20%	100/15 Summer				85.818
S1.007	S6	30 Winter	100	+20%	100/15 Summer				85.990
S4.000	S10	30 Summer	100	+20%	100/15 Summer				86.001
S1.008	S7	30 Winter	100	+20%	100/15 Summer				85.996

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.120	0.000	0.05			0.5	FLOOD RISK	
S1.001	S1	0.134	0.000	0.03			0.4	FLOOD RISK	
S2.000	S4	0.123	0.000	0.28			4.0	FLOOD RISK	
S1.002	S2	0.210	0.000	0.34			4.1	FLOOD RISK	
S1.003	S3	0.275	0.000	0.11		86	1.3	FLOOD RISK	
S3.000	S6	0.022	0.000	0.13			1.4	SURCHARGED	
S1.004	S4	0.192	0.000	0.20			2.2	SURCHARGED	
S1.005	S5	0.259	0.000	0.26			2.9	SURCHARGED	
S1.006	S10	0.330	0.000	0.05			0.5	SURCHARGED	
S1.007	S6	0.538	0.000	0.06			1.0	FLOOD RISK	
S4.000	S10	0.476	0.000	0.08			3.5	SURCHARGED	
S1.008	S7	0.577	0.000	0.49			16.8	FLOOD RISK	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S5.000	S12	30 Winter	100	+20%	100/15 Summer				85.989
S1.009	S8	30 Winter	100	+20%	100/15 Summer				85.986
S6.000	S14	30 Summer	100	+20%	100/15 Summer				85.951
S1.010	S9	30 Summer	100	+20%	100/15 Summer				85.939
S7.000	S16	600 Winter	100	+20%	100/15 Summer				85.658
S1.011	S10	600 Winter	100	+20%	100/15 Summer				85.658
S8.000	S18	240 Winter	100	+20%					85.732
S8.001	S18	240 Winter	100	+20%	100/30 Winter				85.731
S9.000	S20	240 Winter	100	+20%					85.731
S8.002	S19	240 Winter	100	+20%	100/15 Winter				85.730
S8.003	S23	600 Winter	100	+20%	100/60 Summer				85.697
S10.000	S22	15 Winter	100	+20%					85.701
S8.004	S20	600 Winter	100	+20%	100/15 Winter				85.697
S1.012	S11	600 Winter	100	+20%	100/15 Summer				85.817

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S5.000	S12	0.564	0.000	0.09			2.7	FLOOD RISK	
S1.009	S8	0.748	0.000	0.63			24.8	FLOOD RISK	
S6.000	S14	0.801	0.000	0.49			5.9	FLOOD RISK	
S1.010	S9	0.876	0.000	1.28			51.9	FLOOD RISK	
S7.000	S16	0.508	0.000	0.05			0.7	SURCHARGED	
S1.011	S10	0.837	0.000	0.06			5.0	SURCHARGED	
S8.000	S18	-0.018	0.000	0.10		156	0.5	OK	
S8.001	S18	0.027	0.000	0.06		265	0.3	SURCHARGED	
S9.000	S20	-0.069	0.000	0.09			1.0	OK	
S8.002	S19	0.046	0.000	0.04			0.5	SURCHARGED	
S8.003	S23	0.085	0.000	0.02		541	0.2	SURCHARGED	
S10.000	S22	-0.099	0.000	0.25			2.7	OK	
S8.004	S20	0.139	0.000	0.02			0.2	SURCHARGED	
S1.012	S11	1.247	0.000	0.19			2.0	SURCHARGED	