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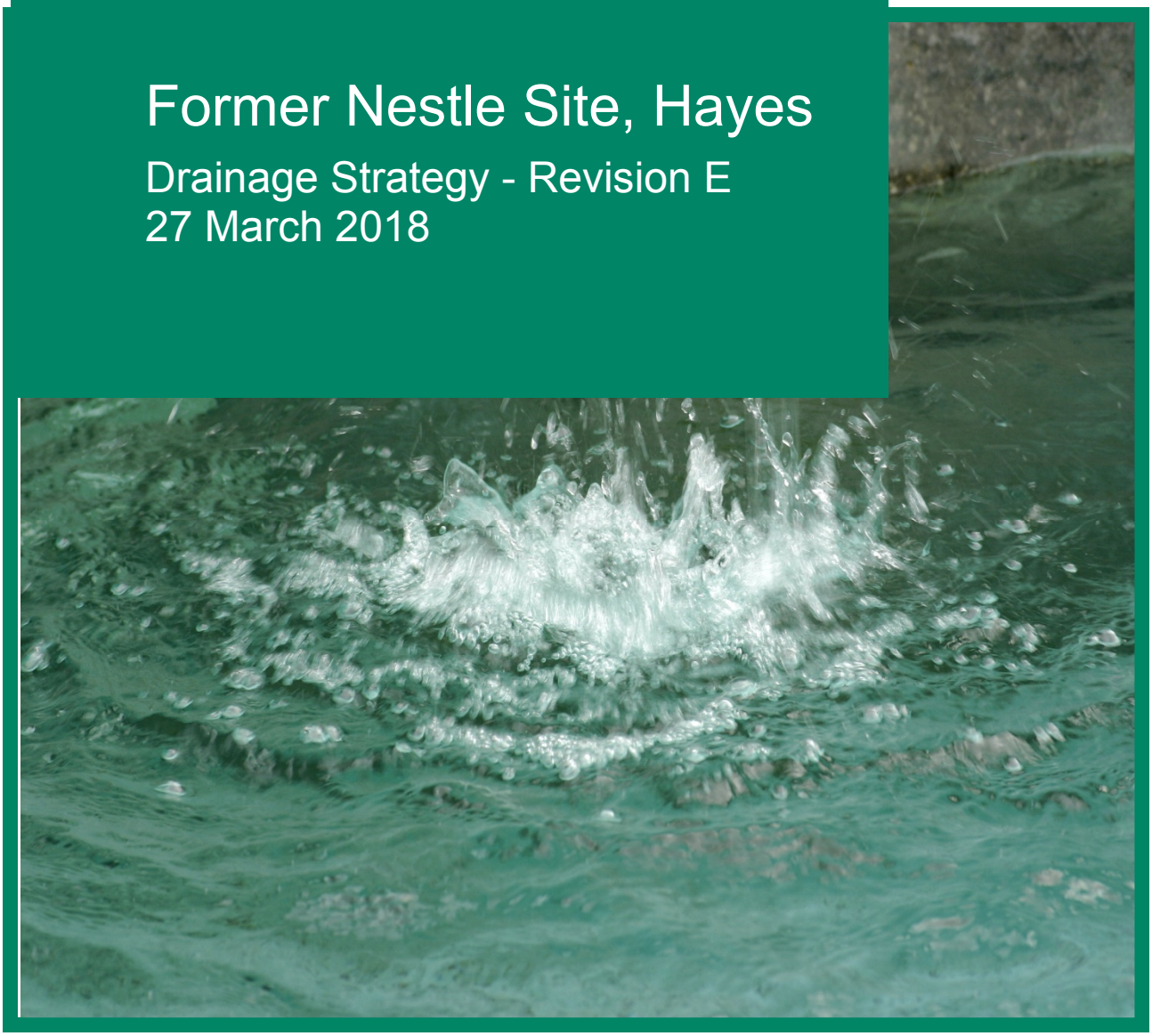
Former Nestle Site, Hayes

Drainage Strategy - Revision E
27 March 2018



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Drainage Strategy – Revision E

(by G. Males)

Surface water drainage strategy

References;

Capita drawings and calculations

075666-CA-0-GF-DR-S-010-P05 “Drainage layout and external levels Sheet 1 of 2”.

075666-CA-0-GF-DR-S-011-P05 “Drainage layout and external levels Sheet 2 of 2”.

Surface water drainage calculations.

Michael Sparks Associates drawing

MS101-Issue D2 “Former Nestle Factory, Hayes”.

Greenhatch Group drawing

20897-OGL- Rev 0 “Topographical Survey”.

In accordance with the requirements of NPPF (National Planning Policy Framework), and accompanying Planning Practice Guidance, a review of the development site was undertaken for the use of suitable SUD’s techniques. As a result below ground storage vessels, in the form of modular geo-void systems (VersaVoid by ESS or similar), have been utilised along with a maximum off-site discharge of 32.50 l/sec for 1 in 2 years return period (6.28 l/sec/ha), 34.00 l/sec for 1 in 30 years return period (6.57 l/sec/ha) and 80.00 l/sec for 1 in 100 years plus 20% climate change return period (15.46 l/sec/ha) utilising complex flow controls. These figures are based on those agreed with the London Borough of Hillingdon drainage officer.

Ground investigations undertaken at the site identified a degree of variability in stratigraphy and, most notably, very shallow groundwater (between about 0.9 and 1.5m below current ground level). Soil infiltration rate testing was undertaken as part of these investigations to assess the viability of soakaway drainage. These tests recorded negligible infiltration rates and the use of soakaways within the new development has therefore been discounted. Refer to Capita Property and Infrastructure ‘Further Geo-environmental Assessment’ dated 31 May 2016.

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Notwithstanding the above the opportunity has been taken to include permeable paving for the car parking areas to improve the quality of the surface water runoff from these areas. These will be of Type C construction (no infiltration).

The surface water drainage network is a gravity system and has been designed in accordance with the requirements of BS EN 752:2008 namely no surcharging during a critical storm event of 1 in 2 years return period and no exceedance flooding during a critical storm event of 1 in 30 years return period.
In addition, in accordance with the Environment Agency's requirements, the flows and volumes produced from critical storm events in excess of 1 in 30 years up to 1 in 100 years return period, plus a 20% allowance for climate change, have been assessed.

Minor exceedance flooding has been contained in the dock loading areas of Units 1 and 4 which has been shown on the latest drawings. The storage pipe in the access road has been designed to cater for all flows up to 1 in 100 years + 20%CC as well as acting as a carrier pipe for the controlled discharges from each Unit.

The controlled surface water flow will discharge off-site via existing Thames Water manhole 2909 in Nestles Avenue subject to a Section 106 agreement with Thames Water.

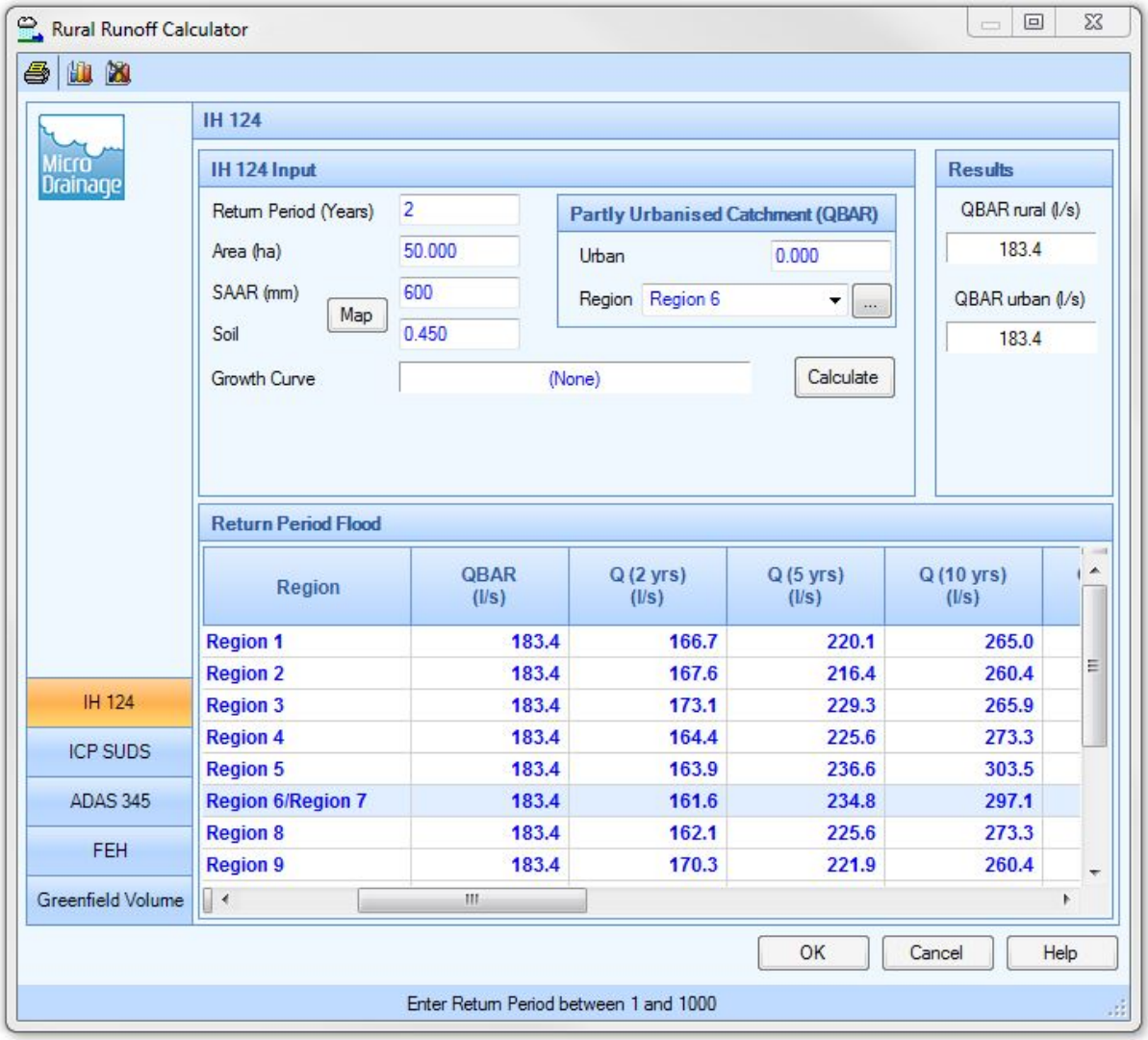
Pollution control to be provided by full retention separators in service yard areas. In addition a further bypass separator has been provided prior to final discharge from the site to cater for pollution that may arise from the main access road. All separators to be in accordance with BS EN 858-1.

Foul water drainage strategy

The foul water flows are collected by a gravity system and discharge off-site via existing Thames Water manhole 2908 in Nestles Avenue subject to a Section 106 Agreement (indirect connection) with Thames Water.

CS/075666 – Former Nestle site, Hayes

Rural runoff calculation – 1 in 2 year return period



Site area = 5.175ha

Where the site is less than 50ha then the 50ha result for discharge is calculated and a pro-rata discharge linearly interpolated.

QBAR (1 in 2 years) = 161.6 l/sec for a 50ha site

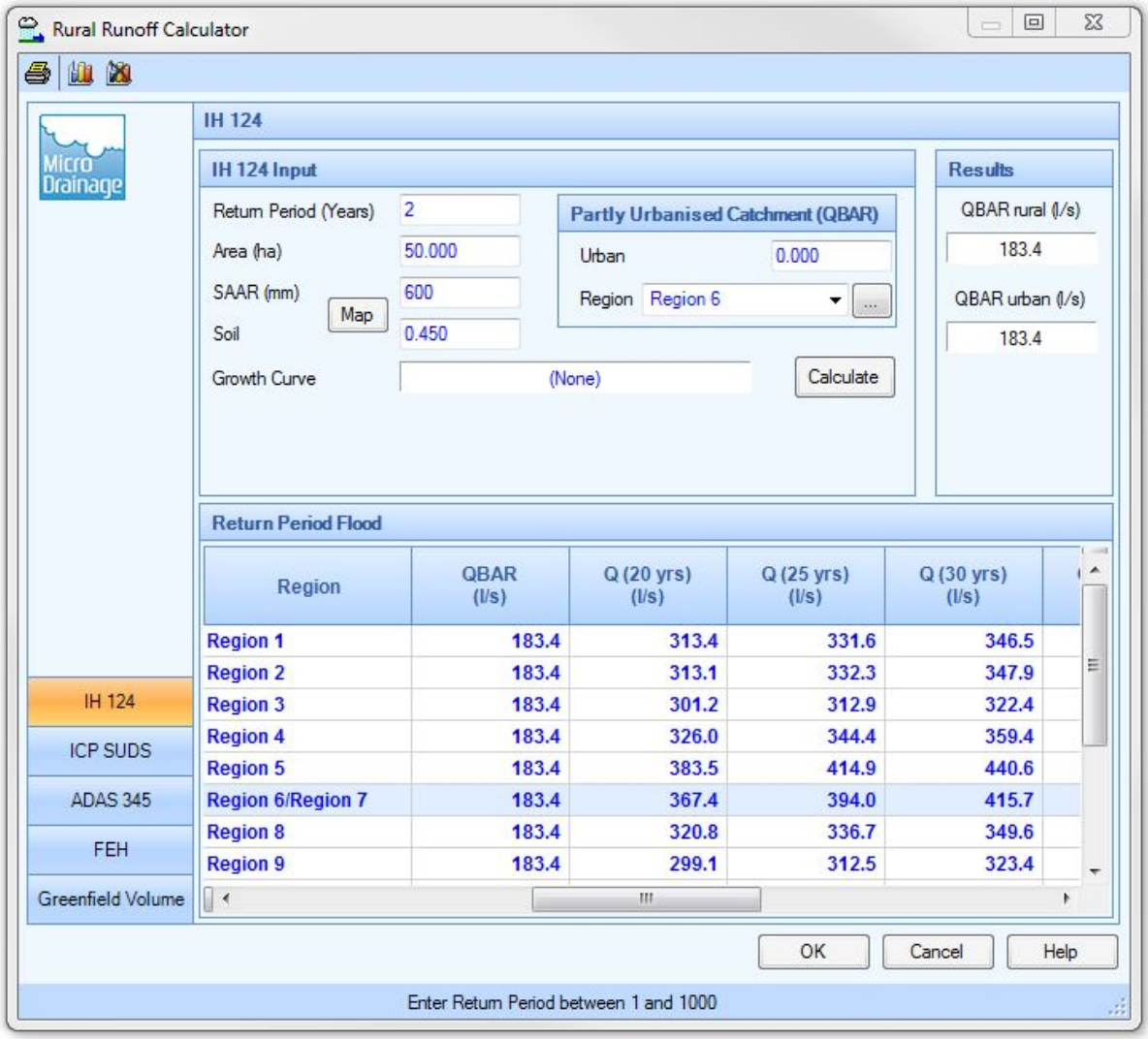
5.175ha/50.000ha = 0.104

161.6 x 0.104 = 16.8 l/sec

16.8 l/sec/5.175ha = 3.25 l/sec/ha

CS/075666 – Former Nestle site, Hayes

Rural runoff calculation – 1 in 30 year return period



Site area = 5.175ha

Where the site is less than 50ha then the 50ha result for discharge is calculated and a pro-rata discharge linearly interpolated.

QBAR (1 in 30 years) = 415.7 l/sec for a 50ha site

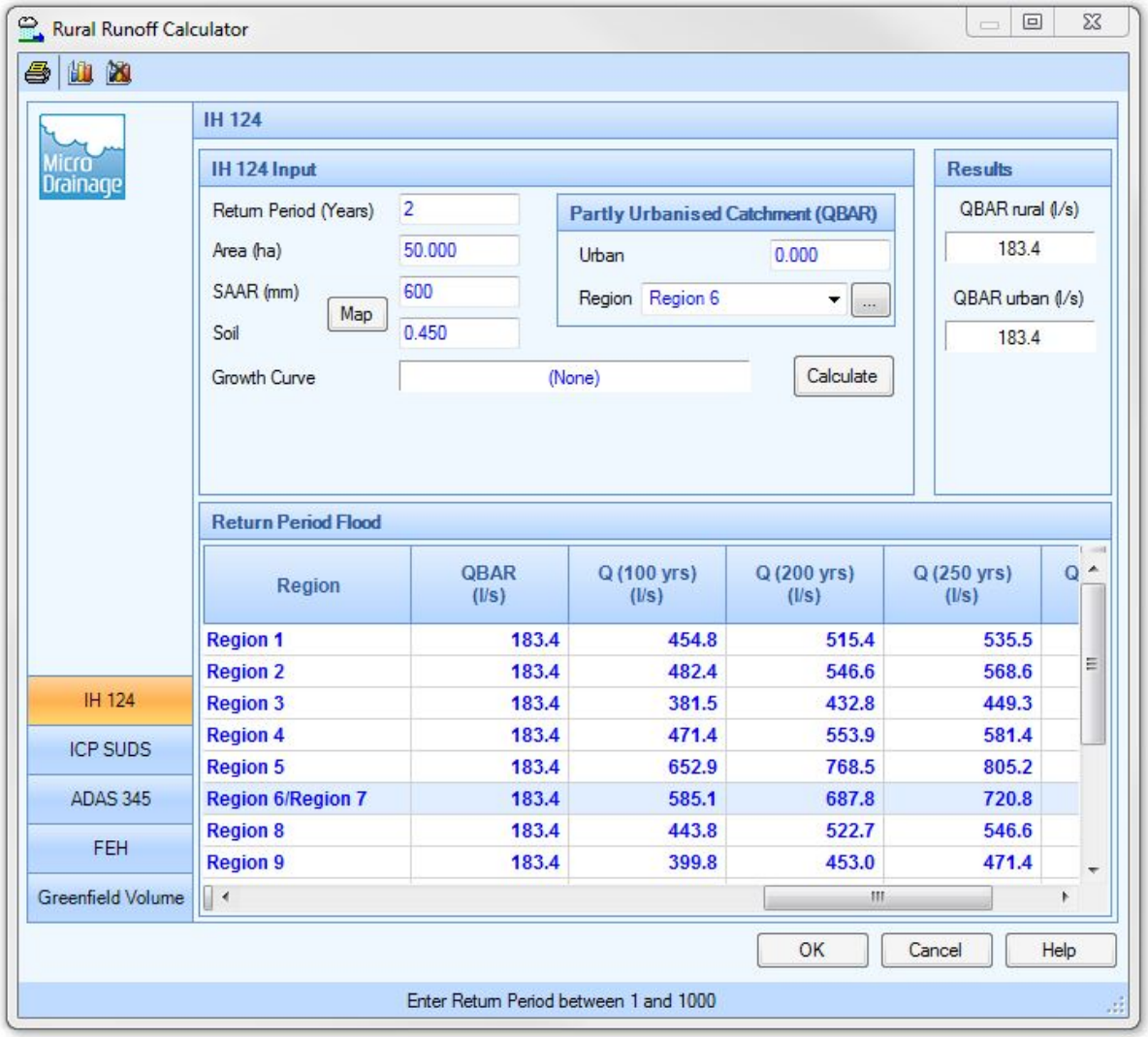
5.175ha/50.000ha = 0.104

415.7 x 0.104 = 43.2 l/sec

43.2 l/sec/5.175ha = 8.35 l/sec/ha

CS/075666 – Former Nestle site, Hayes

Rural runoff calculation – 1 in 100 year return period



Site area = 5.175ha

Where the site is less than 50ha then the 50ha result for discharge is calculated and a pro-rata discharge linearly interpolated.

QBAR (1 in 100 years) = 585.1 l/sec for a 50ha site

5.175ha/50.000ha = 0.104

585.1 x 0.104 = 60.85 l/sec

60.85 l/sec/5.175ha = 11.76 l/sec/ha

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CS/075666 – Former Nestle Site, Hayes

Assessment of pre and post-development surface water runoff.

(by G. Males)

Total site area = approx. 5.175 ha or 51750m^2
(ref. MSA Architect's Site masterplan drawing 30680-FE-44 rev I)

From visual inspection of Greenhatch Group surveys drawing 20897-OGL-Rev 0 (dated October 2014) 95% of site is covered by hardstanding areas.

51750 x 95% = 49162m^2

Pre-development runoff

Ave. intensity for **1 in 1 year** return period (15min summer storm)
= 33.106 mm/hr

33.106 / 3600 = 0.0092 l/sec/m^2

0.0092 x 49162 = 452.290 say **452 l/sec**

Ave. intensity for **1 in 100 year +20%CC** return period (15min summer storm)
= 126.917 mm/hr

126.917 / 3600 = 0.0353 l/sec/m^2

0.0353 x 49162 = 1735.419 say **1735 l/sec**

Post-development runoff

Off-site discharge (1 in 1 year) = 29.4 l/sec (5.68 l/sec/ha)

Off-site discharge (1 in 2 years) = 32.5 l/sec (6.28 l/sec/ha)

Off-site discharge (1 in 30 years) = 34 l/sec (6.57 l/sec/ha)

Off-site discharge (1 in 100 years) = 49.2 l/sec (9.51 l/sec/ha)

Off-site discharge (1 in 100 years +20%CC) = 80 l/sec (15.46 l/sec/ha)

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Attenuation

Maximimum flow off site = 80 l/sec (refer to separate calculations)

80 / 1735 = 0.046

Therefore the proposed surface water drainage strategy provides **95.5% attenuation** for storms up to 1 in 100 year +20%%CC.

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.691	4-8	2.006	8-12	1.396	12-16	0.026

Total Area Contributing (ha) = 4.118

Total Pipe Volume (m^3) = 345.027

Existing Network Details 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
1.000	10.400	0.145	71.7	0.097	6.00	0.0	0.600	o	225	Pipe/Conduit
2.000	18.345	0.185	99.2	0.365	6.00	0.0	0.600	o	300	Pipe/Conduit
1.001	17.420	0.085	204.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
1.002	6.200	0.100	62.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
1.003	5.465	0.125	43.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
3.000	12.845	0.095	135.2	0.134	6.00	0.0	0.600	o	225	Pipe/Conduit
4.000	7.285	0.175	41.6	0.112	6.00	0.0	0.600	o	225	Pipe/Conduit
3.001	23.005	0.670	34.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.004	5.500	0.030	183.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit
5.000	3.800	0.235	16.2	0.703	6.00	0.0	0.600	o	375	Pipe/Conduit
1.005	26.160	0.265	98.7	0.072	0.00	0.0	0.600	o	300	Pipe/Conduit
6.000	34.395	0.345	99.7	0.010	6.00	0.0	0.600	o	150	Pipe/Conduit
6.001	36.605	0.365	100.3	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	29.475	0.097	0.0	1.55	61.5
2.000	29.440	0.365	0.0	1.58	111.6
1.001	29.180	0.462	0.0	1.26	139.4
1.002	29.095	0.462	0.0	2.30	254.5
1.003	29.095	0.462	0.0	2.75	303.4
3.000	29.885	0.134	0.0	1.12	44.6
4.000	29.965	0.112	0.0	2.03	80.8
3.001	29.790	0.246	0.0	2.24	89.1
1.004	28.895	0.708	0.0	1.50	238.3
5.000	29.585	0.703	0.0	4.53	499.8
1.005	28.500	1.483	0.0	1.58	111.9
6.000	29.555	0.010	0.0	1.01	17.8
6.001	29.210	0.018	0.0	1.00	17.7

Existing Network Details 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
6.002	26.925	0.270	99.7	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit
6.003	20.455	0.205	99.8	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit
7.000	40.880	0.410	99.7	0.015	6.00	0.0	0.600	o	150	Pipe/Conduit
7.001	33.470	0.335	99.9	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit
7.002	19.055	0.425	44.8	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit
6.004	14.595	0.100	145.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
8.000	9.875	0.140	70.5	0.030	6.00	0.0	0.600	o	150	Pipe/Conduit
9.000	9.820	0.080	122.7	0.138	6.00	0.0	0.600	o	225	Pipe/Conduit
8.001	16.470	0.085	193.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
8.002	4.640	0.050	92.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
8.003	5.735	0.030	191.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
10.000	40.330	0.200	201.7	0.161	6.00	0.0	0.600	o	300	Pipe/Conduit
10.001	16.310	0.175	93.2	0.206	0.00	0.0	0.600	o	300	Pipe/Conduit
8.004	19.055	0.125	152.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
6.002	28.845	0.030	0.0	1.01	17.8
6.003	28.575	0.043	0.0	1.01	17.8
7.000	29.540	0.015	0.0	1.01	17.8
7.001	29.130	0.027	0.0	1.01	17.8
7.002	28.795	0.042	0.0	1.51	26.6
6.004	28.295	0.085	0.0	1.08	42.9
8.000	29.400	0.030	0.0	1.20	21.2
9.000	29.265	0.138	0.0	1.18	46.9
8.001	29.110	0.168	0.0	1.13	79.6
8.002	29.025	0.168	0.0	1.63	115.4
8.003	28.975	0.168	0.0	1.13	80.1
10.000	29.550	0.161	0.0	1.10	78.0
10.001	29.350	0.367	0.0	1.63	115.2
8.004	28.250	0.535	0.0	1.06	42.0

Existing Network Details 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
1.006	51.000	0.000	0.0	0.042	0.00	0.0	0.600	o	1200	Pipe/Conduit
1.007	51.530	0.000	0.0	0.058	0.00	0.0	0.600	o	1200	Pipe/Conduit
1.008	25.775	0.000	0.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit
1.009	65.935	0.000	0.0	0.106	0.00	0.0	0.600	o	1200	Pipe/Conduit
1.010	23.645	0.000	0.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit
11.000	12.495	0.130	96.1	0.028	6.00	0.0	0.600	o	150	Pipe/Conduit
12.000	8.740	0.070	124.9	0.131	6.00	0.0	0.600	o	225	Pipe/Conduit
11.001	5.955	0.030	198.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
11.002	4.640	0.050	92.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
11.003	7.680	0.040	192.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
11.004	11.645	0.060	194.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
11.005	46.985	0.155	303.1	0.101	0.00	0.0	0.600	o	375	Pipe/Conduit
13.000	11.050	0.075	147.3	0.066	6.00	0.0	0.600	o	225	Pipe/Conduit
13.001	7.775	0.055	141.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
11.006	18.800	0.125	150.4	0.101	0.00	0.0	0.600	o	225	Pipe/Conduit
14.000	10.840	0.075	144.5	0.064	6.00	0.0	0.600	o	225	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.006	27.335	2.145	0.0	0.00	0.0
1.007	27.335	2.203	0.0	0.00	0.0
1.008	27.335	2.203	0.0	0.00	0.0
1.009	27.335	2.309	0.0	0.00	0.0
1.010	27.335	2.309	0.0	0.00	0.0
11.000	29.400	0.028	0.0	1.03	18.1
12.000	29.265	0.131	0.0	1.17	46.5
11.001	29.120	0.159	0.0	1.11	78.6
11.002	29.090	0.159	0.0	1.63	115.4
11.003	29.040	0.159	0.0	1.13	80.0
11.004	29.000	0.159	0.0	1.13	79.5
11.005	28.865	0.260	0.0	1.04	114.4
13.000	29.040	0.066	0.0	1.07	42.7
13.001	28.965	0.066	0.0	1.10	43.6
11.006	28.250	0.427	0.0	1.06	42.3
14.000	28.350	0.064	0.0	1.09	43.2

Existing Network Details 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
15.000	10.720	0.190	56.4	0.247	6.00	0.0	0.600	o	300	Pipe/Conduit
14.001	2.855	0.030	95.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
14.002	6.850	0.050	137.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
14.003	1.715	0.020	85.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
16.000	9.065	0.090	100.7	0.102	6.00	0.0	0.600	o	225	Pipe/Conduit
16.001	3.075	0.030	102.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
17.000	25.125	0.125	201.0	0.355	6.00	0.0	0.600	o	375	Pipe/Conduit
18.000	9.045	0.155	58.4	0.064	6.00	0.0	0.600	o	225	Pipe/Conduit
17.001	35.865	0.200	179.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
17.002	23.975	0.135	177.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
17.003	3.250	0.065	50.0	0.355	0.00	0.0	0.600	o	375	Pipe/Conduit
14.004	12.830	0.115	111.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.011	55.650	0.000	0.0	0.116	0.00	0.0	0.600	o	1000	Pipe/Conduit
1.012	28.380	0.055	516.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
15.000	28.390	0.247	0.0	2.10	148.3
14.001	28.200	0.311	0.0	1.61	113.9
14.002	28.170	0.311	0.0	1.34	94.8
14.003	28.120	0.311	0.0	1.70	120.1
16.000	28.515	0.102	0.0	1.30	51.8
16.001	28.425	0.102	0.0	1.29	51.3
17.000	28.570	0.355	0.0	1.27	140.7
18.000	28.750	0.064	0.0	1.72	68.2
17.001	28.445	0.419	0.0	1.35	149.1
17.002	28.245	0.419	0.0	1.36	149.8
17.003	28.110	0.774	0.0	2.57	283.6
14.004	27.450	1.187	0.0	1.24	49.2
1.011	27.335	4.039	0.0	0.00	0.0
1.012	27.335	4.039	0.0	1.07	301.2

Existing Network Details 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
1.013	7.045	0.015	469.7	0.079	0.00	0.0	0.600	o	450	Pipe/Conduit
1.014	5.250	0.100	52.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit
1.015	7.105	0.015	473.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.013	27.280	4.118	0.0	0.93	148.1
1.014	27.265	4.118	0.0	2.81	447.1
1.015	27.165	4.118	0.0	0.93	147.5

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)
SP	29.925	0.450	Open Manhole	750 x 750	1.000	29.475	225				
SP	30.490	1.050	Open Manhole	750 x 750	2.000	29.440	300				
S46	31.075	1.895	Open Manhole	1500	1.001	29.180	375	1.000	29.330	225	
								2.000	29.255	300	
PI IN	30.970	1.875	Open Manhole	1500	1.002	29.095	375	1.001	29.095	375	
PI OUT	30.970	1.975	Open Manhole	1500	1.003	29.095	375	1.002	28.995	375	
SP	30.860	0.975	Open Manhole	750 x 750	3.000	29.885	225				
SP	30.940	0.975	Open Manhole	750 x 750	4.000	29.965	225				
S44	31.045	1.255	Open Manhole	1200	3.001	29.790	225	3.000	29.790	225	
								4.000	29.790	225	
S45	31.045	2.150	Open Manhole	1500	1.004	28.895	450	1.003	28.970	375	
								3.001	29.120	225	
S41	30.960	1.375	Open Manhole	1500	5.000	29.585	375				
S42	30.965	2.465	Open Manhole	1500	1.005	28.500	300	1.004	28.865	450	515
								5.000	29.350	375	925
S101	30.455	0.900	Open Manhole	600	6.000	29.555	150				
S102	30.430	1.220	Open Manhole	600	6.001	29.210	150	6.000	29.210	150	
S103	30.400	1.555	Open Manhole	600	6.002	28.845	150	6.001	28.845	150	
S104	30.360	1.785	Open Manhole	600	6.003	28.575	150	6.002	28.575	150	
S106	30.440	0.900	Open Manhole	600	7.000	29.540	150				
S107	30.440	1.310	Open Manhole	600	7.001	29.130	150	7.000	29.130	150	
S108	30.465	1.670	Open Manhole	600	7.002	28.795	150	7.001	28.795	150	
S105	30.350	2.055	Open Manhole	1200	6.004	28.295	225	6.003	28.370	150	
								7.002	28.370	150	
SP	29.675	0.275	Open Manhole	750 x 750	8.000	29.400	150				
SP	30.240	0.975	Open Manhole	750 x 750	9.000	29.265	225				
S34	30.630	1.520	Open Manhole	1500	8.001	29.110	300	8.000	29.260	150	
								9.000	29.185	225	
PI IN	30.850	1.825	Open Manhole	1500	8.002	29.025	300	8.001	29.025	300	
PI OUT	30.850	1.875	Open Manhole	1500	8.003	28.975	300	8.002	28.975	300	
S31	30.850	1.300	Open Manhole	1500	10.000	29.550	300				
S32	30.850	1.500	Open Manhole	1500	10.001	29.350	300	10.000	29.350	300	
S33	31.035	2.785	Open Manhole	1200	8.004	28.250	225	8.003	28.945	300	770
								10.001	29.175	300	1000
S1	30.945	3.610	Open Manhole	2400	1.006	27.335	1200	1.005	28.235	300	
								6.004	28.195	225	
								8.004	28.125	225	
S2	30.825	3.490	Open Manhole	2400	1.007	27.335	1200	1.006	27.335	1200	

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)
S3	30.705	3.370	Open Manhole	2400	1.008	27.335	1200	1.007	27.335	1200	
S4	30.125	2.790	Open Manhole	2400	1.009	27.335	1200	1.008	27.335	1200	
S5	30.120	2.785	Open Manhole	2400	1.010	27.335	1200	1.009	27.335	1200	
SP	29.675	0.275	Open Manhole	750 x 750	11.000	29.400	150				
SP	30.240	0.975	Open Manhole	750 x 750	12.000	29.265	225				
S23	30.505	1.385	Open Manhole	1500	11.001	29.120	300	11.000	29.270	150	
								12.000	29.195	225	
PI IN	30.700	1.610	Open Manhole	1500	11.002	29.090	300	11.001	29.090	300	
PI OUT	30.700	1.660	Open Manhole	1500	11.003	29.040	300	11.002	29.040	300	
S24	30.235	1.235	Open Manhole	1500	11.004	29.000	300	11.003	29.000	300	
S25	30.235	1.370	Open Manhole	1500	11.005	28.865	375	11.004	28.940	300	
SP	30.015	0.975	Open Manhole	750 x 750	13.000	29.040	225				
S21	30.330	1.365	Open Manhole	1200	13.001	28.965	225	13.000	28.965	225	
S22	30.375	2.125	Open Manhole	1200	11.006	28.250	225	11.005	28.710	375	610
								13.001	28.910	225	660
SP	28.875	0.525	Open Manhole	750 x 750	14.000	28.350	225				
SP	29.440	1.050	Open Manhole	750 x 750	15.000	28.390	300				
S17	29.830	1.630	Open Manhole	1500	14.001	28.200	300	14.000	28.275	225	
								15.000	28.200	300	
PI IN	29.830	1.660	Open Manhole	1500	14.002	28.170	300	14.001	28.170	300	
PI OUT	29.830	1.710	Open Manhole	1500	14.003	28.120	300	14.002	28.120	300	
SP	29.490	0.975	Open Manhole	750 x 750	16.000	28.515	225				
S16	29.770	1.345	Open Manhole	1200	16.001	28.425	225	16.000	28.425	225	
S11	29.945	1.375	Open Manhole	1500	17.000	28.570	375				
SP	29.725	0.975	Open Manhole	750 x 750	18.000	28.750	225				
S12	29.800	1.355	Open Manhole	1500	17.001	28.445	375	17.000	28.445	375	
								18.000	28.595	225	
S13	29.985	1.740	Open Manhole	1500	17.002	28.245	375	17.001	28.245	375	
S14	30.080	1.970	Open Manhole	1500	17.003	28.110	375	17.002	28.110	375	
S15	29.675	2.225	Open Manhole	1200	14.004	27.450	225	14.003	28.100	300	725
								16.001	28.395	225	945
								17.003	28.045	375	745
S6	29.940	2.605	Open Manhole	2100	1.011	27.335	1000	1.010	27.335	1200	
								11.006	28.125	225	15
								14.004	27.335	225	
S7	29.045	1.710	Open Manhole	1800	1.012	27.335	600	1.011	27.335	1000	
S8	28.645	1.365	Open Manhole	1500	1.013	27.280	450	1.012	27.280	600	
PI IN	28.800	1.535	Open Manhole	1500	1.014	27.265	450	1.013	27.265	450	

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)
PI OUT	28.800	1.635	Open Manhole	1500	1.015	27.165	450	1.014	27.165	450	
EX. SWMH	28.220	1.070	Open Manhole	1500		OUTFALL		1.015	27.150	450	

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)
1.000	o	225	SP	29.925	29.475	0.225	Open Manhole	750 x 750
2.000	o	300	SP	30.490	29.440	0.750	Open Manhole	750 x 750
1.001	o	375	S46	31.075	29.180	1.520	Open Manhole	1500
1.002	o	375	PI IN	30.970	29.095	1.500	Open Manhole	1500
1.003	o	375	PI OUT	30.970	29.095	1.500	Open Manhole	1500
3.000	o	225	SP	30.860	29.885	0.750	Open Manhole	750 x 750
4.000	o	225	SP	30.940	29.965	0.750	Open Manhole	750 x 750
3.001	o	225	S44	31.045	29.790	1.030	Open Manhole	1200
1.004	o	450	S45	31.045	28.895	1.700	Open Manhole	1500
5.000	o	375	S41	30.960	29.585	1.000	Open Manhole	1500
1.005	o	300	S42	30.965	28.500	2.165	Open Manhole	1500
6.000	o	150	S101	30.455	29.555	0.750	Open Manhole	600

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)
1.000	10.400	71.7	S46	31.075	29.330	1.520	Open Manhole	1500
2.000	18.345	99.2	S46	31.075	29.255	1.520	Open Manhole	1500
1.001	17.420	204.9	PI IN	30.970	29.095	1.500	Open Manhole	1500
1.002	6.200	62.0	PI OUT	30.970	28.995	1.600	Open Manhole	1500
1.003	5.465	43.7	S45	31.045	28.970	1.700	Open Manhole	1500
3.000	12.845	135.2	S44	31.045	29.790	1.030	Open Manhole	1200
4.000	7.285	41.6	S44	31.045	29.790	1.030	Open Manhole	1200
3.001	23.005	34.3	S45	31.045	29.120	1.700	Open Manhole	1500
1.004	5.500	183.3	S42	30.965	28.865	1.650	Open Manhole	1500
5.000	3.800	16.2	S42	30.965	29.350	1.240	Open Manhole	1500
1.005	26.160	98.7	S1	30.945	28.235	2.410	Open Manhole	2400
6.000	34.395	99.7	S102	30.430	29.210	1.070	Open Manhole	600

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)
6.001	o	150	S102	30.430	29.210	1.070	Open Manhole	600
6.002	o	150	S103	30.400	28.845	1.405	Open Manhole	600
6.003	o	150	S104	30.360	28.575	1.635	Open Manhole	600
7.000	o	150	S106	30.440	29.540	0.750	Open Manhole	600
7.001	o	150	S107	30.440	29.130	1.160	Open Manhole	600
7.002	o	150	S108	30.465	28.795	1.520	Open Manhole	600
6.004	o	225	S105	30.350	28.295	1.830	Open Manhole	1200
8.000	o	150	SP	29.675	29.400	0.125	Open Manhole	750 x 750
9.000	o	225	SP	30.240	29.265	0.750	Open Manhole	750 x 750
8.001	o	300	S34	30.630	29.110	1.220	Open Manhole	1500
8.002	o	300	PI IN	30.850	29.025	1.525	Open Manhole	1500
8.003	o	300	PI OUT	30.850	28.975	1.575	Open Manhole	1500
10.000	o	300	S31	30.850	29.550	1.000	Open Manhole	1500
10.001	o	300	S32	30.850	29.350	1.200	Open Manhole	1500

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)
6.001	36.605	100.3	S103	30.400	28.845	1.405	Open Manhole	600
6.002	26.925	99.7	S104	30.360	28.575	1.635	Open Manhole	600
6.003	20.455	99.8	S105	30.350	28.370	1.830	Open Manhole	1200
7.000	40.880	99.7	S107	30.440	29.130	1.160	Open Manhole	600
7.001	33.470	99.9	S108	30.465	28.795	1.520	Open Manhole	600
7.002	19.055	44.8	S105	30.350	28.370	1.830	Open Manhole	1200
6.004	14.595	145.9	S1	30.945	28.195	2.525	Open Manhole	2400
8.000	9.875	70.5	S34	30.630	29.260	1.220	Open Manhole	1500
9.000	9.820	122.7	S34	30.630	29.185	1.220	Open Manhole	1500
8.001	16.470	193.8	PI IN	30.850	29.025	1.525	Open Manhole	1500
8.002	4.640	92.8	PI OUT	30.850	28.975	1.575	Open Manhole	1500
8.003	5.735	191.2	S33	31.035	28.945	1.790	Open Manhole	1200
10.000	40.330	201.7	S32	30.850	29.350	1.200	Open Manhole	1500
10.001	16.310	93.2	S33	31.035	29.175	1.560	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)
8.004	o	225	S33	31.035	28.250	2.560	Open Manhole	1200
1.006	o	1200	S1	30.945	27.335	2.410	Open Manhole	2400
1.007	o	1200	S2	30.825	27.335	2.290	Open Manhole	2400
1.008	o	1200	S3	30.705	27.335	2.170	Open Manhole	2400
1.009	o	1200	S4	30.125	27.335	1.590	Open Manhole	2400
1.010	o	1200	S5	30.120	27.335	1.585	Open Manhole	2400
11.000	o	150	SP	29.675	29.400	0.125	Open Manhole	750 x 750
12.000	o	225	SP	30.240	29.265	0.750	Open Manhole	750 x 750
11.001	o	300	S23	30.505	29.120	1.085	Open Manhole	1500
11.002	o	300	PI IN	30.700	29.090	1.310	Open Manhole	1500
11.003	o	300	PI OUT	30.700	29.040	1.360	Open Manhole	1500
11.004	o	300	S24	30.235	29.000	0.935	Open Manhole	1500
11.005	o	375	S25	30.235	28.865	0.995	Open Manhole	1500
13.000	o	225	SP	30.015	29.040	0.750	Open Manhole	750 x 750
13.001	o	225	S21	30.330	28.965	1.140	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)
8.004	19.055	152.4	S1	30.945	28.125	2.595	Open Manhole	2400
1.006	51.000	0.0	S2	30.825	27.335	2.290	Open Manhole	2400
1.007	51.530	0.0	S3	30.705	27.335	2.170	Open Manhole	2400
1.008	25.775	0.0	S4	30.125	27.335	1.590	Open Manhole	2400
1.009	65.935	0.0	S5	30.120	27.335	1.585	Open Manhole	2400
1.010	23.645	0.0	S6	29.940	27.335	1.405	Open Manhole	2100
11.000	12.495	96.1	S23	30.505	29.270	1.085	Open Manhole	1500
12.000	8.740	124.9	S23	30.505	29.195	1.085	Open Manhole	1500
11.001	5.955	198.5	PI IN	30.700	29.090	1.310	Open Manhole	1500
11.002	4.640	92.8	PI OUT	30.700	29.040	1.360	Open Manhole	1500
11.003	7.680	192.0	S24	30.235	29.000	0.935	Open Manhole	1500
11.004	11.645	194.1	S25	30.235	28.940	0.995	Open Manhole	1500
11.005	46.985	303.1	S22	30.375	28.710	1.290	Open Manhole	1200
13.000	11.050	147.3	S21	30.330	28.965	1.140	Open Manhole	1200
13.001	7.775	141.4	S22	30.375	28.910	1.240	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)
11.006	o	225	S22	30.375	28.250	1.900	Open Manhole	1200
14.000	o	225	SP	28.875	28.350	0.300	Open Manhole	750 x 750
15.000	o	300	SP	29.440	28.390	0.750	Open Manhole	750 x 750
14.001	o	300	S17	29.830	28.200	1.330	Open Manhole	1500
14.002	o	300	PI IN	29.830	28.170	1.360	Open Manhole	1500
14.003	o	300	PI OUT	29.830	28.120	1.410	Open Manhole	1500
16.000	o	225	SP	29.490	28.515	0.750	Open Manhole	750 x 750
16.001	o	225	S16	29.770	28.425	1.120	Open Manhole	1200
17.000	o	375	S11	29.945	28.570	1.000	Open Manhole	1500
18.000	o	225	SP	29.725	28.750	0.750	Open Manhole	750 x 750
17.001	o	375	S12	29.800	28.445	0.980	Open Manhole	1500
17.002	o	375	S13	29.985	28.245	1.365	Open Manhole	1500
17.003	o	375	S14	30.080	28.110	1.595	Open Manhole	1500

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)
11.006	18.800	150.4	S6	29.940	28.125	1.590	Open Manhole	2100
14.000	10.840	144.5	S17	29.830	28.275	1.330	Open Manhole	1500
15.000	10.720	56.4	S17	29.830	28.200	1.330	Open Manhole	1500
14.001	2.855	95.2	PI IN	29.830	28.170	1.360	Open Manhole	1500
14.002	6.850	137.0	PI OUT	29.830	28.120	1.410	Open Manhole	1500
14.003	1.715	85.8	S15	29.675	28.100	1.275	Open Manhole	1200
16.000	9.065	100.7	S16	29.770	28.425	1.120	Open Manhole	1200
16.001	3.075	102.5	S15	29.675	28.395	1.055	Open Manhole	1200
17.000	25.125	201.0	S12	29.800	28.445	0.980	Open Manhole	1500
18.000	9.045	58.4	S12	29.800	28.595	0.980	Open Manhole	1500
17.001	35.865	179.3	S13	29.985	28.245	1.365	Open Manhole	1500
17.002	23.975	177.6	S14	30.080	28.110	1.595	Open Manhole	1500
17.003	3.250	50.0	S15	29.675	28.045	1.255	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)
14.004	o	225	S15	29.675	27.450	2.000	Open Manhole	1200
1.011	o	1000	S6	29.940	27.335	1.605	Open Manhole	2100
1.012	o	600	S7	29.045	27.335	1.110	Open Manhole	1800
1.013	o	450	S8	28.645	27.280	0.915	Open Manhole	1500
1.014	o	450	PI IN	28.800	27.265	1.085	Open Manhole	1500
1.015	o	450	PI OUT	28.800	27.165	1.185	Open Manhole	1500

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)
14.004	12.830	111.6	S6	29.940	27.335	2.380	Open Manhole	2100
1.011	55.650	0.0	S7	29.045	27.335	0.710	Open Manhole	1800
1.012	28.380	516.0	S8	28.645	27.280	0.765	Open Manhole	1500
1.013	7.045	469.7	PI IN	28.800	27.265	1.085	Open Manhole	1500
1.014	5.250	52.5	PI OUT	28.800	27.165	1.185	Open Manhole	1500
1.015	7.105	473.7	EX. SWMH	28.220	27.150	0.620	Open Manhole	1500

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)
1.015	EX. SWMH	28.220	27.150	0.000	1500	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.925	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	3.000
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	4
Number of Online Controls	5	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Region	England and Wales
Return Period (years)	5	M5-60 (mm)	20.700

Synthetic Rainfall Details

Ratio R	0.438	Cv (Winter)	0.925
Profile Type	Winter	Storm Duration (mins)	30
Cv (Summer)	0.925		

Online Controls for Storm

Complex Manhole: S42, DS/PN: 1.005, Volume (m³): 5.2

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0159-1150-0700-1150
Design Head (m)	0.700
Design Flow (l/s)	11.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	159
Invert Level (m)	28.500
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	11.5
Flush-Flo™	0.255	11.5
Kick-Flo®	0.518	10.0
Mean Flow over Head Range	-	9.5

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	5.7	1.200	14.8	3.000	23.0	7.000	34.6
0.200	11.4	1.400	16.0	3.500	24.7	7.500	35.6
0.300	11.4	1.600	17.0	4.000	26.4	8.000	36.8
0.400	11.1	1.800	18.0	4.500	27.9	8.500	37.9
0.500	10.3	2.000	18.9	5.000	29.4	9.000	39.0
0.600	10.7	2.200	19.8	5.500	30.8	9.500	40.1
0.800	12.2	2.400	20.6	6.000	32.1		
1.000	13.6	2.600	21.4	6.500	33.3		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0240-2950-0600-2950
Design Head (m)	0.600
Design Flow (l/s)	29.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	240
Invert Level (m)	29.200

Hydro-Brake® Optimum

Minimum Outlet Pipe Diameter (mm) 300
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	29.5
Flush-Flo™	0.335	29.4
Kick-Flo®	0.511	27.3
Mean Flow over Head Range	-	22.2

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	7.9	1.200	41.1	3.000	64.1	7.000	96.2
0.200	24.3	1.400	44.3	3.500	69.0	7.500	99.6
0.300	29.3	1.600	47.3	4.000	73.7	8.000	102.9
0.400	29.2	1.800	50.0	4.500	78.0	8.500	106.1
0.500	27.6	2.000	52.6	5.000	82.1	9.000	109.3
0.600	29.5	2.200	55.1	5.500	86.0	9.500	112.3
0.800	33.8	2.400	57.5	6.000	89.8		
1.000	37.7	2.600	59.8	6.500	92.6		

Complex Manhole: S33, DS/PN: 8.004, Volume (m³): 4.5

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0105-4500-0700-4500
Design Head (m)	0.700
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	28.250
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	4.5
Flush-Flo™	0.212	4.5
Kick-Flo®	0.477	3.8
Mean Flow over Head Range	-	3.8

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

Hydro-Brake® Optimum

invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	5.8	3.000	8.9	7.000	13.3
0.200	4.5	1.400	6.2	3.500	9.6	7.500	13.7
0.300	4.4	1.600	6.6	4.000	10.2	8.000	14.2
0.400	4.2	1.800	7.0	4.500	10.8	8.500	14.6
0.500	3.9	2.000	7.3	5.000	11.3	9.000	15.0
0.600	4.2	2.200	7.7	5.500	11.8	9.500	15.4
0.800	4.8	2.400	8.0	6.000	12.4		
1.000	5.3	2.600	8.3	6.500	12.8		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0157-1100-0600-1100
Design Head (m)	0.600
Design Flow (l/s)	11.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	157
Invert Level (m)	28.950
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	11.0
Flush-Flo™	0.245	11.0
Kick-Flo®	0.459	9.7
Mean Flow over Head Range	-	8.9

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	5.6	1.200	15.3	3.000	23.6	7.000	35.5
0.200	10.9	1.400	16.4	3.500	25.5	7.500	36.7
0.300	10.9	1.600	17.5	4.000	27.2	8.000	38.0
0.400	10.4	1.800	18.5	4.500	28.7	8.500	39.1
0.500	10.1	2.000	19.5	5.000	30.2	9.000	40.3
0.600	11.0	2.200	20.4	5.500	31.7	9.500	41.4
0.800	12.6	2.400	21.2	6.000	33.0		
1.000	14.0	2.600	22.1	6.500	34.2		

Complex Manhole: S22, DS/PN: 11.006, Volume (m³): 7.7

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0093-3500-0700-3500
Design Head (m)	0.700
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	93
Invert Level (m)	28.250
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	3.5
Flush-Flo™	0.209	3.5
Kick-Flo®	0.468	2.9
Mean Flow over Head Range	-	3.0

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	3.0	1.200	4.5	3.000	6.9	7.000	10.3
0.200	3.5	1.400	4.8	3.500	7.4	7.500	10.6
0.300	3.4	1.600	5.1	4.000	7.9	8.000	11.0
0.400	3.3	1.800	5.4	4.500	8.3	8.500	11.3
0.500	3.0	2.000	5.7	5.000	8.8	9.000	11.6
0.600	3.3	2.200	6.0	5.500	9.2	9.500	12.0
0.800	3.7	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.4	6.500	9.9		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0144-9000-0600-9000
Design Head (m)	0.600
Design Flow (l/s)	9.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	144
Invert Level (m)	28.950
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Hydro-Brake® Optimum

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	9.0
Flush-Flo™	0.226	9.0
Kick-Flo®	0.450	7.9
Mean Flow over Head Range	-	7.4

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	5.2	1.200	12.5	3.000	19.3	7.000	28.9
0.200	9.0	1.400	13.4	3.500	20.8	7.500	30.0
0.300	8.9	1.600	14.3	4.000	22.2	8.000	31.0
0.400	8.4	1.800	15.1	4.500	23.4	8.500	31.9
0.500	8.3	2.000	15.9	5.000	24.7	9.000	32.9
0.600	9.0	2.200	16.6	5.500	25.8	9.500	33.8
0.800	10.3	2.400	17.3	6.000	26.9		
1.000	11.4	2.600	18.0	6.500	27.9		

Complex Manhole: S15, DS/PN: 14.004, Volume (m³): 2.8

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0143-9000-0700-9000
Design Head (m)	0.700
Design Flow (l/s)	9.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	143
Invert Level (m)	27.450
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	9.0
Flush-Flo™	0.238	9.0
Kick-Flo®	0.507	7.7
Mean Flow over Head Range	-	7.5

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

Hydro-Brake® Optimum

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.2	1.200	11.6	3.000	17.9	7.000	26.9
0.200	8.9	1.400	12.5	3.500	19.3	7.500	27.7
0.300	8.9	1.600	13.3	4.000	20.6	8.000	28.7
0.400	8.6	1.800	14.1	4.500	21.8	8.500	29.6
0.500	7.9	2.000	14.8	5.000	22.9	9.000	30.4
0.600	8.4	2.200	15.5	5.500	24.0	9.500	31.3
0.800	9.6	2.400	16.1	6.000	25.0		
1.000	10.6	2.600	16.7	6.500	26.0		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0216-2300-0600-2300
Design Head (m)	0.600
Design Flow (l/s)	23.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	216
Invert Level (m)	28.150
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	23.0
Flush-Flo™	0.311	23.0
Kick-Flo®	0.497	21.0
Mean Flow over Head Range	-	17.7

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	7.3	1.200	32.0	3.000	49.8	7.000	74.8
0.200	21.1	1.400	34.5	3.500	53.7	7.500	77.5
0.300	22.9	1.600	36.8	4.000	57.3	8.000	80.1
0.400	22.5	1.800	38.9	4.500	60.7	8.500	82.6
0.500	21.1	2.000	41.0	5.000	63.9	9.000	85.0
0.600	23.0	2.200	42.9	5.500	66.9	9.500	87.3
0.800	26.4	2.400	44.7	6.000	69.8		
1.000	29.4	2.600	46.5	6.500	72.1		

Complex Manhole: S8, DS/PN: 1.013, Volume (m³): 10.0

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0254-3400-0650-3400
Design Head (m)	0.650
Design Flow (l/s)	34.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	254
Invert Level (m)	27.280
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.650	34.0
Flush-Flo™	0.358	34.0
Kick-Flo®	0.552	31.4
Mean Flow over Head Range	-	25.8

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	8.2	1.200	45.6	3.000	71.1	7.000	106.6
0.200	26.0	1.400	49.1	3.500	76.6	7.500	110.4
0.300	33.7	1.600	52.4	4.000	81.8	8.000	114.1
0.400	33.9	1.800	55.5	4.500	86.6	8.500	117.6
0.500	32.7	2.000	58.4	5.000	91.2	9.000	121.1
0.600	32.7	2.200	61.2	5.500	95.5	9.500	124.4
0.800	37.5	2.400	63.8	6.000	99.6		
1.000	41.8	2.600	66.3	6.500	103.6		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0378-8600-0605-8600
Design Head (m)	0.605
Design Flow (l/s)	86.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	378
Invert Level (m)	27.930
Minimum Outlet Pipe Diameter (mm)	450
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.605	86.0
Flush-Flo™	0.478	85.9

Hydro-Brake® Optimum

Control Points	Head (m)	Flow (l/s)
Kick-Flo®	0.583	84.5
Mean Flow over Head Range	-	55.9

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	10.6	1.200	119.9	3.000	187.6	7.000	280.9
0.200	37.7	1.400	129.3	3.500	202.3	7.500	291.0
0.300	71.5	1.600	138.0	4.000	216.0	8.000	300.8
0.400	85.0	1.800	146.1	4.500	228.8	8.500	310.3
0.500	85.8	2.000	153.8	5.000	241.0	9.000	319.5
0.600	85.6	2.200	161.2	5.500	252.5	9.500	328.4
0.800	98.5	2.400	168.2	6.000	263.6		
1.000	109.7	2.600	174.9	6.500	270.4		

Storage Structures for Storm

Cellular Storage Manhole: S42, DS/PN: 1.005

Invert Level (m) 28.500 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	596.0	596.0	1.300	0.0	698.6
0.100	596.0	605.8	1.301	0.0	698.6
0.200	596.0	615.5	1.500	0.0	698.6
0.300	596.0	625.3	1.600	0.0	698.6
0.400	596.0	635.1	1.700	0.0	698.6
0.500	596.0	644.8	1.800	0.0	698.6
0.600	596.0	654.6	1.900	0.0	698.6
0.700	596.0	664.4	2.000	0.0	698.6
0.800	596.0	674.1	2.100	0.0	698.6
0.900	596.0	683.9	2.200	0.0	698.6
1.000	596.0	693.7	2.300	0.0	698.6
1.050	596.0	698.5	2.400	0.0	698.6
1.051	0.0	698.6	2.500	0.0	698.6

Cellular Storage Manhole: S33, DS/PN: 8.004

Invert Level (m) 28.250 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	220.0	220.0	1.300	0.0	297.1
0.100	220.0	225.9	1.301	0.0	297.2
0.200	220.0	231.9	1.500	0.0	297.2
0.300	220.0	237.8	1.600	0.0	297.2
0.400	220.0	243.7	1.700	0.0	297.2
0.500	220.0	249.7	1.800	0.0	297.2
0.600	220.0	255.6	1.900	0.0	297.2
0.700	220.0	261.5	2.000	0.0	297.2
0.800	220.0	267.5	2.100	0.0	297.2
0.900	220.0	273.4	2.200	0.0	297.2
1.000	220.0	279.3	2.300	0.0	297.2
1.050	220.0	285.3	2.400	0.0	297.2
1.051	0.0	291.2	2.500	0.0	297.2

Cellular Storage Manhole: S22, DS/PN: 11.006

Invert Level (m) 28.250 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Cellular Storage Manhole: S22, DS/PN: 11.006

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	170.0	170.0	1.300	0.0	237.8
0.100	170.0	175.2	1.301	0.0	237.8
0.200	170.0	180.4	1.500	0.0	237.8
0.300	170.0	185.6	1.600	0.0	237.8
0.400	170.0	190.9	1.700	0.0	237.8
0.500	170.0	196.1	1.800	0.0	237.8
0.600	170.0	201.3	1.900	0.0	237.8
0.700	170.0	206.5	2.000	0.0	237.8
0.800	170.0	211.7	2.100	0.0	237.8
0.900	170.0	216.9	2.200	0.0	237.8
1.000	170.0	222.2	2.300	0.0	237.8
1.050	170.0	227.4	2.400	0.0	237.8
1.051	0.0	232.6	2.500	0.0	237.8

Cellular Storage Manhole: S15, DS/PN: 14.004

Invert Level (m) 27.450 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	474.0	474.0	1.300	474.0	587.2
0.100	474.0	482.7	1.301	0.0	587.3
0.200	474.0	491.4	1.500	0.0	587.3
0.300	474.0	500.1	1.600	0.0	587.3
0.400	474.0	508.8	1.700	0.0	587.3
0.500	474.0	517.5	1.800	0.0	587.3
0.600	474.0	526.3	1.900	0.0	587.3
0.700	474.0	535.0	2.000	0.0	587.3
0.800	474.0	543.7	2.100	0.0	587.3
0.900	474.0	552.4	2.200	0.0	587.3
1.000	474.0	561.1	2.300	0.0	587.3
1.100	474.0	569.8	2.400	0.0	587.3
1.200	474.0	578.5	2.500	0.0	587.3

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	3.000
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	4
Number of Online Controls	5	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 0.438
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.700	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, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SP	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
2.000	SP	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
1.001	S46	15 Winter	1	+0%	30/15 Summer			
1.002	PI IN	15 Winter	1	+0%	30/15 Summer			
1.003	PI OUT	15 Winter	1	+0%	30/15 Summer			
3.000	SP	15 Winter	1	+0%	30/15 Summer			
4.000	SP	15 Winter	1	+0%	100/15 Summer			
3.001	S44	15 Winter	1	+0%	30/15 Winter			
1.004	S45	15 Winter	1	+0%	30/15 Summer			
5.000	S41	15 Winter	1	+0%	30/15 Summer			
1.005	S42	240 Winter	1	+0%	2/60 Winter			
6.000	S101	15 Winter	1	+0%				
6.001	S102	15 Winter	1	+0%				
6.002	S103	15 Winter	1	+0%	100/15 Summer			
6.003	S104	15 Winter	1	+0%	100/15 Summer			
7.000	S106	15 Winter	1	+0%				
7.001	S107	15 Winter	1	+0%				

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

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	SP	29.552	-0.148	0.000	0.26		13.3	OK	5
2.000	SP	29.594	-0.146	0.000	0.52		50.1	OK	2
1.001	S46	29.380	-0.175	0.000	0.55		63.2	OK	
1.002	PI IN	29.291	-0.179	0.000	0.51		63.0	OK	
1.003	PI OUT	29.273	-0.197	0.000	0.46		63.2	OK	
3.000	SP	29.995	-0.115	0.000	0.48		18.4	OK	
4.000	SP	30.043	-0.147	0.000	0.26		15.4	OK	
3.001	S44	29.891	-0.124	0.000	0.41		33.8	OK	
1.004	S45	29.173	-0.172	0.000	0.69		96.5	OK	
5.000	S41	29.775	-0.185	0.000	0.51		96.5	OK	
1.005	S42	28.782	-0.018	0.000	0.11		10.9	OK	
6.000	S101	29.583	-0.122	0.000	0.08		1.4	OK	
6.001	S102	29.247	-0.113	0.000	0.13		2.3	OK	
6.002	S103	28.893	-0.102	0.000	0.22		3.7	OK	
6.003	S104	28.633	-0.092	0.000	0.31		5.3	OK	
7.000	S106	29.574	-0.116	0.000	0.12		2.0	OK	
7.001	S107	29.176	-0.104	0.000	0.20		3.4	OK	

1 year Return Period 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.
7.002	S108	15 Winter	1	+0%				
6.004	S105	15 Winter	1	+0%	100/15 Summer			
8.000	SP	15 Winter	1	+0%	100/15 Summer			
9.000	SP	15 Winter	1	+0%	30/15 Summer			
8.001	S34	15 Winter	1	+0%	100/15 Summer			
8.002	PI IN	15 Winter	1	+0%	100/15 Summer			
8.003	PI OUT	15 Winter	1	+0%	100/15 Summer			
10.000	S31	15 Winter	1	+0%	100/15 Summer			
10.001	S32	15 Winter	1	+0%	30/15 Summer			
8.004	S33	180 Winter	1	+0%	1/60 Winter			
1.006	S1	240 Winter	1	+0%	100/120 Winter			
1.007	S2	240 Winter	1	+0%	100/240 Winter			
1.008	S3	240 Winter	1	+0%				
1.009	S4	240 Winter	1	+0%				
1.010	S5	240 Winter	1	+0%				
11.000	SP	15 Winter	1	+0%	100/15 Summer			
12.000	SP	15 Winter	1	+0%	30/15 Summer			
11.001	S23	15 Winter	1	+0%	100/15 Summer			
11.002	PI IN	15 Winter	1	+0%	100/15 Summer			
11.003	PI OUT	15 Winter	1	+0%	100/15 Summer			
11.004	S24	15 Winter	1	+0%	100/15 Summer			
11.005	S25	15 Winter	1	+0%	100/15 Summer			
13.000	SP	15 Winter	1	+0%				
13.001	S21	15 Winter	1	+0%	100/120 Winter			
11.006	S22	180 Winter	1	+0%	1/60 Winter			
14.000	SP	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
15.000	SP	15 Winter	1	+0%	30/15 Summer			
14.001	S17	15 Winter	1	+0%	30/15 Summer			
14.002	PI IN	15 Winter	1	+0%	30/15 Summer			
14.003	PI OUT	15 Winter	1	+0%	30/15 Summer			
16.000	SP	15 Winter	1	+0%	30/15 Winter			
16.001	S16	15 Winter	1	+0%	30/15 Winter			
17.000	S11	15 Winter	1	+0%	30/15 Summer			
18.000	SP	15 Winter	1	+0%	30/15 Summer			
17.001	S12	15 Winter	1	+0%	30/15 Summer			
17.002	S13	15 Winter	1	+0%	30/15 Summer			
17.003	S14	15 Winter	1	+0%	2/15 Winter			
14.004	S15	360 Winter	1	+0%	1/30 Winter			
1.011	S6	240 Winter	1	+0%	100/120 Winter			
1.012	S7	240 Winter	1	+0%	100/30 Winter			
1.013	S8	240 Winter	1	+0%	30/60 Winter			
1.014	PI IN	240 Winter	1	+0%				
1.015	PI OUT	240 Winter	1	+0%				

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

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
7.002	S108	28.842	-0.103	0.000	0.21		5.3	OK	
6.004	S105	28.376	-0.144	0.000	0.28		10.5	OK	
8.000	SP	29.447	-0.103	0.000	0.22		4.1	OK	
9.000	SP	29.376	-0.114	0.000	0.49		19.0	OK	
8.001	S34	29.231	-0.179	0.000	0.34		23.0	OK	
8.002	PI IN	29.152	-0.173	0.000	0.37		23.0	OK	
8.003	PI OUT	29.110	-0.165	0.000	0.42		23.1	OK	
10.000	S31	29.663	-0.187	0.000	0.30		21.6	OK	
10.001	S32	29.497	-0.153	0.000	0.48		46.7	OK	
8.004	S33	28.505	0.030	0.000	0.12		4.4	SURCHARGED	
1.006	S1	27.664	-0.871	0.000	0.02		18.7	OK	
1.007	S2	27.660	-0.875	0.000	0.02		18.8	OK	
1.008	S3	27.656	-0.879	0.000	0.03		17.2	OK	
1.009	S4	27.653	-0.882	0.000	0.02		19.2	OK	
1.010	S5	27.648	-0.887	0.000	0.03		17.5	OK	
11.000	SP	29.449	-0.101	0.000	0.23		3.8	OK	
12.000	SP	29.375	-0.115	0.000	0.48		18.0	OK	
11.001	S23	29.252	-0.168	0.000	0.40		21.8	OK	
11.002	PI IN	29.214	-0.176	0.000	0.35		21.7	OK	
11.003	PI OUT	29.166	-0.174	0.000	0.37		21.9	OK	
11.004	S24	29.123	-0.177	0.000	0.36		21.8	OK	
11.005	S25	29.009	-0.231	0.000	0.31		33.0	OK	
13.000	SP	29.116	-0.149	0.000	0.25		9.1	OK	
13.001	S21	29.045	-0.145	0.000	0.27		9.1	OK	
11.006	S22	28.510	0.035	0.000	0.09		3.4	SURCHARGED	
14.000	SP	28.425	-0.150	0.000	0.24		8.8	OK	4
15.000	SP	28.504	-0.186	0.000	0.31		34.0	OK	
14.001	S17	28.385	-0.115	0.000	0.69		42.6	OK	
14.002	PI IN	28.355	-0.115	0.000	0.69		42.5	OK	
14.003	PI OUT	28.320	-0.100	0.000	0.78		42.8	OK	
16.000	SP	28.604	-0.136	0.000	0.33		14.0	OK	
16.001	S16	28.533	-0.117	0.000	0.47		14.0	OK	
17.000	S11	28.734	-0.211	0.000	0.40		48.4	OK	
18.000	SP	28.810	-0.165	0.000	0.16		8.8	OK	
17.001	S12	28.616	-0.204	0.000	0.42		56.7	OK	
17.002	S13	28.438	-0.182	0.000	0.43		55.8	OK	
17.003	S14	28.386	-0.099	0.000	0.88		94.3	OK	
14.004	S15	27.780	0.105	0.000	0.18		7.8	SURCHARGED	
1.011	S6	27.645	-0.690	0.000	0.04		28.8	OK	
1.012	S7	27.631	-0.304	0.000	0.12		28.8	OK	
1.013	S8	27.607	-0.123	0.000	0.29		29.4	OK	
1.014	PI IN	27.387	-0.328	0.000	0.17		29.4	OK	
1.015	PI OUT	27.332	-0.283	0.000	0.30		29.4	OK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	3.000
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	4
Number of Online Controls	5	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	0.438
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.700	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, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SP	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
2.000	SP	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
1.001	S46	15 Winter	2	+0%	30/15 Summer			
1.002	PI IN	15 Winter	2	+0%	30/15 Summer			
1.003	PI OUT	15 Winter	2	+0%	30/15 Summer			
3.000	SP	15 Winter	2	+0%	30/15 Summer			
4.000	SP	15 Winter	2	+0%	100/15 Summer			
3.001	S44	15 Winter	2	+0%	30/15 Winter			
1.004	S45	15 Winter	2	+0%	30/15 Summer			
5.000	S41	15 Winter	2	+0%	30/15 Summer			
1.005	S42	180 Winter	2	+0%	2/60 Winter			
6.000	S101	15 Winter	2	+0%				
6.001	S102	15 Winter	2	+0%				
6.002	S103	15 Winter	2	+0%	100/15 Summer			
6.003	S104	15 Winter	2	+0%	100/15 Summer			
7.000	S106	15 Winter	2	+0%				
7.001	S107	15 Winter	2	+0%				

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

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	SP	29.564	-0.136	0.000	0.33		17.2	OK	5
2.000	SP	29.621	-0.119	0.000	0.67		64.8	OK	2
1.001	S46	29.416	-0.139	0.000	0.71		81.3	OK	
1.002	PI IN	29.327	-0.143	0.000	0.66		81.6	OK	
1.003	PI OUT	29.302	-0.168	0.000	0.59		81.7	OK	
3.000	SP	30.013	-0.097	0.000	0.62		23.8	OK	
4.000	SP	30.055	-0.135	0.000	0.34		19.9	OK	
3.001	S44	29.908	-0.107	0.000	0.54		43.7	OK	
1.004	S45	29.227	-0.118	0.000	0.90		124.5	OK	
5.000	S41	29.807	-0.153	0.000	0.66		124.8	OK	
1.005	S42	28.860	0.060	0.000	0.11		10.9	SURCHARGED	
6.000	S101	29.587	-0.118	0.000	0.10		1.8	OK	
6.001	S102	29.252	-0.108	0.000	0.17		3.0	OK	
6.002	S103	28.900	-0.095	0.000	0.28		4.8	OK	
6.003	S104	28.642	-0.083	0.000	0.41		6.8	OK	
7.000	S106	29.579	-0.111	0.000	0.15		2.6	OK	
7.001	S107	29.182	-0.098	0.000	0.26		4.4	OK	

2 year Return Period 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.
7.002	S108	15 Winter	2	+0%				
6.004	S105	15 Winter	2	+0%	100/15 Summer			
8.000	SP	15 Winter	2	+0%	100/15 Summer			
9.000	SP	15 Winter	2	+0%	30/15 Summer			
8.001	S34	15 Winter	2	+0%	100/15 Summer			
8.002	PI IN	15 Winter	2	+0%	100/15 Summer			
8.003	PI OUT	15 Winter	2	+0%	100/15 Summer			
10.000	S31	15 Winter	2	+0%	100/15 Summer			
10.001	S32	15 Winter	2	+0%	30/15 Summer			
8.004	S33	180 Winter	2	+0%	1/60 Winter			
1.006	S1	240 Winter	2	+0%	100/120 Winter			
1.007	S2	240 Winter	2	+0%	100/240 Winter			
1.008	S3	240 Winter	2	+0%				
1.009	S4	240 Winter	2	+0%				
1.010	S5	240 Winter	2	+0%				
11.000	SP	15 Winter	2	+0%	100/15 Summer			
12.000	SP	15 Winter	2	+0%	30/15 Summer			
11.001	S23	15 Winter	2	+0%	100/15 Summer			
11.002	PI IN	15 Winter	2	+0%	100/15 Summer			
11.003	PI OUT	15 Winter	2	+0%	100/15 Summer			
11.004	S24	15 Winter	2	+0%	100/15 Summer			
11.005	S25	15 Winter	2	+0%	100/15 Summer			
13.000	SP	15 Winter	2	+0%				
13.001	S21	15 Winter	2	+0%	100/120 Winter			
11.006	S22	180 Winter	2	+0%	1/60 Winter			
14.000	SP	15 Winter	2	+0%	30/15 Summer	100/15 Summer		
15.000	SP	15 Winter	2	+0%	30/15 Summer			
14.001	S17	15 Winter	2	+0%	30/15 Summer			
14.002	PI IN	15 Winter	2	+0%	30/15 Summer			
14.003	PI OUT	15 Winter	2	+0%	30/15 Summer			
16.000	SP	15 Winter	2	+0%	30/15 Winter			
16.001	S16	15 Winter	2	+0%	30/15 Winter			
17.000	S11	15 Winter	2	+0%	30/15 Summer			
18.000	SP	15 Winter	2	+0%	30/15 Summer			
17.001	S12	15 Winter	2	+0%	30/15 Summer			
17.002	S13	15 Winter	2	+0%	30/15 Summer			
17.003	S14	15 Winter	2	+0%	2/15 Winter			
14.004	S15	360 Winter	2	+0%	1/30 Winter			
1.011	S6	240 Winter	2	+0%	100/120 Winter			
1.012	S7	240 Winter	2	+0%	100/30 Winter			
1.013	S8	240 Winter	2	+0%	30/60 Winter			
1.014	PI IN	240 Winter	2	+0%				
1.015	PI OUT	240 Winter	2	+0%				

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

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
7.002	S108	28.848	-0.097	0.000	0.27		6.8	OK	
6.004	S105	28.389	-0.131	0.000	0.36		13.6	OK	
8.000	SP	29.454	-0.096	0.000	0.28		5.3	OK	
9.000	SP	29.395	-0.095	0.000	0.63		24.5	OK	
8.001	S34	29.249	-0.161	0.000	0.44		29.8	OK	
8.002	PI IN	29.173	-0.152	0.000	0.48		29.7	OK	
8.003	PI OUT	29.132	-0.143	0.000	0.54		29.8	OK	
10.000	S31	29.680	-0.170	0.000	0.39		28.0	OK	
10.001	S32	29.522	-0.128	0.000	0.62		60.4	OK	
8.004	S33	28.586	0.111	0.000	0.12		4.4	SURCHARGED	
1.006	S1	27.703	-0.832	0.000	0.02		19.3	OK	
1.007	S2	27.697	-0.838	0.000	0.02		19.3	OK	
1.008	S3	27.690	-0.845	0.000	0.03		17.4	OK	
1.009	S4	27.688	-0.847	0.000	0.02		19.8	OK	
1.010	S5	27.680	-0.855	0.000	0.03		18.5	OK	
11.000	SP	29.456	-0.094	0.000	0.30		5.0	OK	
12.000	SP	29.394	-0.096	0.000	0.62		23.3	OK	
11.001	S23	29.273	-0.147	0.000	0.52		28.2	OK	
11.002	PI IN	29.233	-0.157	0.000	0.46		28.1	OK	
11.003	PI OUT	29.186	-0.154	0.000	0.48		28.2	OK	
11.004	S24	29.142	-0.158	0.000	0.46		28.2	OK	
11.005	S25	29.032	-0.208	0.000	0.41		42.7	OK	
13.000	SP	29.128	-0.137	0.000	0.32		11.7	OK	
13.001	S21	29.058	-0.132	0.000	0.36		11.7	OK	
11.006	S22	28.595	0.120	0.000	0.09		3.4	SURCHARGED	
14.000	SP	28.446	-0.129	0.000	0.31		11.1	OK	4
15.000	SP	28.522	-0.168	0.000	0.40		43.9	OK	
14.001	S17	28.422	-0.078	0.000	0.89		54.5	OK	
14.002	PI IN	28.392	-0.078	0.000	0.89		54.7	OK	
14.003	PI OUT	28.360	-0.060	0.000	1.00		54.9	OK	
16.000	SP	28.618	-0.122	0.000	0.43		18.1	OK	
16.001	S16	28.552	-0.098	0.000	0.61		18.1	OK	
17.000	S11	28.761	-0.184	0.000	0.51		62.6	OK	
18.000	SP	28.819	-0.156	0.000	0.20		11.4	OK	
17.001	S12	28.644	-0.176	0.000	0.55		73.2	OK	
17.002	S13	28.550	-0.070	0.000	0.53		67.7	OK	
17.003	S14	28.489	0.004	0.000	1.06		113.3	SURCHARGED	
14.004	S15	27.847	0.172	0.000	0.21		8.9	SURCHARGED	
1.011	S6	27.678	-0.657	0.000	0.05		31.6	OK	
1.012	S7	27.660	-0.275	0.000	0.13		31.6	OK	
1.013	S8	27.634	-0.096	0.000	0.33		32.5	OK	
1.014	PI IN	27.394	-0.321	0.000	0.18		32.5	OK	
1.015	PI OUT	27.342	-0.273	0.000	0.33		32.5	OK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	3.000
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	4
Number of Online Controls	5	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 0.438
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.700	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, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SP	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
2.000	SP	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
1.001	S46	15 Winter	30	+0%	30/15 Summer			
1.002	PI IN	15 Winter	30	+0%	30/15 Summer			
1.003	PI OUT	15 Winter	30	+0%	30/15 Summer			
3.000	SP	15 Winter	30	+0%	30/15 Summer			
4.000	SP	15 Winter	30	+0%	100/15 Summer			
3.001	S44	15 Winter	30	+0%	30/15 Winter			
1.004	S45	15 Winter	30	+0%	30/15 Summer			
5.000	S41	15 Winter	30	+0%	30/15 Summer			
1.005	S42	240 Winter	30	+0%	2/60 Winter			
6.000	S101	15 Winter	30	+0%				
6.001	S102	15 Winter	30	+0%				
6.002	S103	15 Winter	30	+0%	100/15 Summer			
6.003	S104	15 Winter	30	+0%	100/15 Summer			
7.000	S106	15 Winter	30	+0%				
7.001	S107	15 Winter	30	+0%				

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

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	SP	29.872	0.172	0.000	0.55		28.4	FLOOD RISK	5
2.000	SP	30.030	0.290	0.000	1.10		105.8	SURCHARGED	2
1.001	S46	29.793	0.238	0.000	1.17		133.2	SURCHARGED	
1.002	PI IN	29.673	0.203	0.000	1.08		133.3	SURCHARGED	
1.003	PI OUT	29.556	0.086	0.000	0.96		132.9	SURCHARGED	
3.000	SP	30.152	0.042	0.000	1.14		44.0	SURCHARGED	
4.000	SP	30.103	-0.087	0.000	0.64		37.5	OK	
3.001	S44	30.039	0.024	0.000	0.96		78.5	SURCHARGED	
1.004	S45	29.430	0.085	0.000	1.50		208.7	SURCHARGED	
5.000	S41	30.065	0.105	0.000	1.21		230.0	SURCHARGED	
1.005	S42	29.246	0.446	0.000	0.14		13.6	SURCHARGED	
6.000	S101	29.600	-0.105	0.000	0.19		3.3	OK	
6.001	S102	29.273	-0.087	0.000	0.36		6.1	OK	
6.002	S103	28.932	-0.063	0.000	0.61		10.4	OK	
6.003	S104	28.688	-0.037	0.000	0.90		15.1	OK	
7.000	S106	29.595	-0.095	0.000	0.29		5.0	OK	
7.001	S107	29.210	-0.070	0.000	0.53		9.1	OK	

30 year Return Period 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.
7.002	S108	15 Winter	30	+0%				
6.004	S105	15 Winter	30	+0%	100/15 Summer			
8.000	SP	15 Winter	30	+0%	100/15 Summer			
9.000	SP	15 Winter	30	+0%	30/15 Summer			
8.001	S34	15 Winter	30	+0%	100/15 Summer			
8.002	PI IN	15 Winter	30	+0%	100/15 Summer			
8.003	PI OUT	15 Winter	30	+0%	100/15 Summer			
10.000	S31	15 Winter	30	+0%	100/15 Summer			
10.001	S32	15 Winter	30	+0%	30/15 Summer			
8.004	S33	180 Winter	30	+0%	1/60 Winter			
1.006	S1	180 Winter	30	+0%	100/120 Winter			
1.007	S2	180 Winter	30	+0%	100/240 Winter			
1.008	S3	180 Winter	30	+0%				
1.009	S4	180 Winter	30	+0%				
1.010	S5	180 Winter	30	+0%				
11.000	SP	15 Winter	30	+0%	100/15 Summer			
12.000	SP	15 Winter	30	+0%	30/15 Summer			
11.001	S23	15 Winter	30	+0%	100/15 Summer			
11.002	PI IN	15 Winter	30	+0%	100/15 Summer			
11.003	PI OUT	15 Winter	30	+0%	100/15 Summer			
11.004	S24	15 Winter	30	+0%	100/15 Summer			
11.005	S25	15 Winter	30	+0%	100/15 Summer			
13.000	SP	15 Winter	30	+0%				
13.001	S21	15 Winter	30	+0%	100/120 Winter			
11.006	S22	180 Winter	30	+0%	1/60 Winter			
14.000	SP	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
15.000	SP	15 Winter	30	+0%	30/15 Summer			
14.001	S17	15 Winter	30	+0%	30/15 Summer			
14.002	PI IN	15 Winter	30	+0%	30/15 Summer			
14.003	PI OUT	15 Winter	30	+0%	30/15 Summer			
16.000	SP	15 Winter	30	+0%	30/15 Winter			
16.001	S16	15 Winter	30	+0%	30/15 Winter			
17.000	S11	15 Winter	30	+0%	30/15 Summer			
18.000	SP	15 Winter	30	+0%	30/15 Summer			
17.001	S12	15 Winter	30	+0%	30/15 Summer			
17.002	S13	15 Winter	30	+0%	30/15 Summer			
17.003	S14	15 Winter	30	+0%	2/15 Winter			
14.004	S15	240 Winter	30	+0%	1/30 Winter			
1.011	S6	180 Winter	30	+0%	100/120 Winter			
1.012	S7	180 Winter	30	+0%	100/30 Winter			
1.013	S8	180 Winter	30	+0%	30/60 Winter			
1.014	PI IN	240 Winter	30	+0%				
1.015	PI OUT	60 Winter	30	+0%				

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

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
7.002	S108	28.879	-0.066	0.000	0.58		14.5	OK	
6.004	S105	28.448	-0.072	0.000	0.79		29.7	OK	
8.000	SP	29.478	-0.072	0.000	0.54		10.1	OK	
9.000	SP	29.518	0.028	0.000	1.20		46.8	SURCHARGED	
8.001	S34	29.322	-0.088	0.000	0.83		56.1	OK	
8.002	PI IN	29.261	-0.064	0.000	0.91		55.6	OK	
8.003	PI OUT	29.236	-0.039	0.000	1.00		55.1	OK	
10.000	S31	29.839	-0.011	0.000	0.74		53.9	OK	
10.001	S32	29.734	0.084	0.000	1.23		120.1	SURCHARGED	
8.004	S33	28.965	0.490	0.000	0.12		4.7	SURCHARGED	
1.006	S1	27.932	-0.603	0.000	0.02		24.6	OK	
1.007	S2	27.918	-0.617	0.000	0.02		23.0	OK	
1.008	S3	27.904	-0.631	0.000	0.03		19.8	OK	
1.009	S4	27.900	-0.635	0.000	0.02		23.2	OK	
1.010	S5	27.885	-0.650	0.000	0.04		20.7	OK	
11.000	SP	29.482	-0.068	0.000	0.57		9.4	OK	
12.000	SP	29.512	0.022	0.000	1.19		44.5	SURCHARGED	
11.001	S23	29.359	-0.061	0.000	0.97		52.9	OK	
11.002	PI IN	29.310	-0.080	0.000	0.88		53.7	OK	
11.003	PI OUT	29.265	-0.075	0.000	0.91		53.9	OK	
11.004	S24	29.218	-0.082	0.000	0.87		53.2	OK	
11.005	S25	29.118	-0.122	0.000	0.77		81.1	OK	
13.000	SP	29.168	-0.097	0.000	0.62		22.3	OK	
13.001	S21	29.101	-0.089	0.000	0.67		22.3	OK	
11.006	S22	28.966	0.491	0.000	0.10		3.7	SURCHARGED	
14.000	SP	28.820	0.245	0.000	0.54		19.5	FLOOD RISK	4
15.000	SP	28.916	0.226	0.000	0.67		72.7	SURCHARGED	
14.001	S17	28.771	0.271	0.000	1.45		89.1	SURCHARGED	
14.002	PI IN	28.640	0.170	0.000	1.44		88.6	SURCHARGED	
14.003	PI OUT	28.512	0.092	0.000	1.62		89.2	SURCHARGED	
16.000	SP	28.761	0.021	0.000	0.75		31.6	SURCHARGED	
16.001	S16	28.660	0.010	0.000	1.05		31.5	SURCHARGED	
17.000	S11	29.132	0.187	0.000	0.90		110.1	SURCHARGED	
18.000	SP	29.055	0.080	0.000	0.37		20.5	SURCHARGED	
17.001	S12	29.034	0.214	0.000	0.96		129.3	SURCHARGED	
17.002	S13	28.853	0.233	0.000	1.02		131.5	SURCHARGED	
17.003	S14	28.736	0.251	0.000	2.03		217.8	SURCHARGED	
14.004	S15	28.244	0.569	0.000	0.21		9.0	SURCHARGED	
1.011	S6	27.881	-0.454	0.000	0.05		34.2	OK	
1.012	S7	27.855	-0.080	0.000	0.14		33.8	OK	
1.013	S8	27.798	0.068	0.000	0.34		34.0	SURCHARGED	
1.014	PI IN	27.397	-0.318	0.000	0.19		34.0	OK	
1.015	PI OUT	27.346	-0.269	0.000	0.34		34.0	OK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	3.000
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	4
Number of Online Controls	5	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 0.438
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.700	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, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SP	15 Winter	100	+20%	30/15 Summer	100/15 Summer		
2.000	SP	15 Winter	100	+20%	30/15 Summer	100/15 Summer		
1.001	S46	15 Winter	100	+20%	30/15 Summer			
1.002	PI IN	15 Winter	100	+20%	30/15 Summer			
1.003	PI OUT	15 Winter	100	+20%	30/15 Summer			
3.000	SP	15 Winter	100	+20%	30/15 Summer			
4.000	SP	15 Winter	100	+20%	100/15 Summer			
3.001	S44	15 Winter	100	+20%	30/15 Winter			
1.004	S45	180 Winter	100	+20%	30/15 Summer			
5.000	S41	15 Winter	100	+20%	30/15 Summer			
1.005	S42	180 Winter	100	+20%	2/60 Winter			
6.000	S101	15 Winter	100	+20%				
6.001	S102	15 Winter	100	+20%				
6.002	S103	15 Winter	100	+20%	100/15 Summer			
6.003	S104	15 Winter	100	+20%	100/15 Summer			
7.000	S106	15 Winter	100	+20%				
7.001	S107	15 Winter	100	+20%				

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

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	SP	29.939	0.239	14.457	1.31		67.3	FLOOD	5
2.000	SP	30.492	0.752	2.144	1.69		162.8	FLOOD	2
1.001	S46	29.962	0.407	0.000	1.35		153.9	SURCHARGED	
1.002	PI IN	29.808	0.338	0.000	1.24		153.7	SURCHARGED	
1.003	PI OUT	29.655	0.185	0.000	1.11		153.7	SURCHARGED	
3.000	SP	30.837	0.727	0.000	1.50		58.0	FLOOD RISK	
4.000	SP	30.746	0.556	0.000	0.81		47.5	SURCHARGED	
3.001	S44	30.622	0.607	0.000	1.28		104.5	SURCHARGED	
1.004	S45	29.542	0.197	0.000	0.65		89.9	SURCHARGED	
5.000	S41	30.535	0.575	0.000	1.86		352.7	SURCHARGED	
1.005	S42	29.538	0.738	0.000	0.43		43.2	SURCHARGED	
6.000	S101	29.612	-0.093	0.000	0.30		5.2	OK	
6.001	S102	29.292	-0.068	0.000	0.56		9.6	OK	
6.002	S103	29.074	0.079	0.000	0.88		14.9	SURCHARGED	
6.003	S104	28.865	0.140	0.000	1.25		20.9	SURCHARGED	
7.000	S106	29.611	-0.079	0.000	0.45		7.8	OK	
7.001	S107	29.238	-0.042	0.000	0.84		14.3	OK	

100 year Return Period 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.
7.002	S108	15 Winter	100	+20%				
6.004	S105	15 Winter	100	+20%	100/15 Summer			
8.000	SP	15 Winter	100	+20%	100/15 Summer			
9.000	SP	15 Winter	100	+20%	30/15 Summer			
8.001	S34	15 Winter	100	+20%	100/15 Summer			
8.002	PI IN	15 Winter	100	+20%	100/15 Summer			
8.003	PI OUT	180 Winter	100	+20%	100/15 Summer			
10.000	S31	15 Winter	100	+20%	100/15 Summer			
10.001	S32	15 Winter	100	+20%	30/15 Summer			
8.004	S33	180 Winter	100	+20%	1/60 Winter			
1.006	S1	360 Winter	100	+20%	100/120 Winter			
1.007	S2	360 Winter	100	+20%	100/240 Winter			
1.008	S3	180 Winter	100	+20%				
1.009	S4	180 Winter	100	+20%				
1.010	S5	180 Winter	100	+20%				
11.000	SP	15 Winter	100	+20%	100/15 Summer			
12.000	SP	15 Winter	100	+20%	30/15 Summer			
11.001	S23	15 Winter	100	+20%	100/15 Summer			
11.002	PI IN	15 Winter	100	+20%	100/15 Summer			
11.003	PI OUT	15 Winter	100	+20%	100/15 Summer			
11.004	S24	15 Winter	100	+20%	100/15 Summer			
11.005	S25	15 Winter	100	+20%	100/15 Summer			
13.000	SP	15 Winter	100	+20%				
13.001	S21	180 Winter	100	+20%	100/120 Winter			
11.006	S22	180 Winter	100	+20%	1/60 Winter			
14.000	SP	15 Winter	100	+20%	30/15 Summer	100/15 Summer		
15.000	SP	15 Winter	100	+20%	30/15 Summer			
14.001	S17	15 Winter	100	+20%	30/15 Summer			
14.002	PI IN	15 Winter	100	+20%	30/15 Summer			
14.003	PI OUT	360 Winter	100	+20%	30/15 Summer			
16.000	SP	15 Winter	100	+20%	30/15 Winter			
16.001	S16	15 Winter	100	+20%	30/15 Winter			
17.000	S11	15 Winter	100	+20%	30/15 Summer			
18.000	SP	15 Winter	100	+20%	30/15 Summer			
17.001	S12	15 Winter	100	+20%	30/15 Summer			
17.002	S13	15 Winter	100	+20%	30/15 Summer			
17.003	S14	15 Winter	100	+20%	2/15 Winter			
14.004	S15	360 Winter	100	+20%	1/30 Winter			
1.011	S6	180 Winter	100	+20%	100/120 Winter			
1.012	S7	180 Winter	100	+20%	100/30 Winter			
1.013	S8	180 Winter	100	+20%	30/60 Winter			
1.014	PI IN	180 Winter	100	+20%				
1.015	PI OUT	180 Winter	100	+20%				

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

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
7.002	S108	28.911	-0.034	0.000	0.90		22.6	OK	
6.004	S105	28.544	0.024	0.000	1.14		43.1	SURCHARGED	
8.000	SP	29.631	0.081	0.000	0.75		14.1	FLOOD RISK	
9.000	SP	29.797	0.307	0.000	1.74		67.6	SURCHARGED	
8.001	S34	29.555	0.145	0.000	1.18		79.9	SURCHARGED	
8.002	PI IN	29.436	0.111	0.000	1.30		79.7	SURCHARGED	
8.003	PI OUT	29.355	0.080	0.000	0.39		21.4	SURCHARGED	
10.000	S31	30.340	0.490	0.000	1.18		85.8	SURCHARGED	
10.001	S32	30.093	0.443	0.000	1.87		182.7	SURCHARGED	
8.004	S33	29.353	0.878	0.000	0.43		16.1	SURCHARGED	
1.006	S1	28.538	0.003	0.000	0.06		61.4	SURCHARGED	
1.007	S2	28.535	0.000	0.000	0.05		54.7	SURCHARGED	
1.008	S3	28.516	-0.019	0.000	0.09		56.6	OK	
1.009	S4	28.480	-0.055	0.000	0.05		58.0	OK	
1.010	S5	28.382	-0.153	0.000	0.10		58.0	OK	
11.000	SP	29.670	0.120	0.000	0.88		14.5	FLOOD RISK	
12.000	SP	29.825	0.335	0.000	1.72		64.2	SURCHARGED	
11.001	S23	29.607	0.187	0.000	1.36		74.2	SURCHARGED	
11.002	PI IN	29.518	0.128	0.000	1.23		75.2	SURCHARGED	
11.003	PI OUT	29.428	0.088	0.000	1.28		75.9	SURCHARGED	
11.004	S24	29.343	0.043	0.000	1.24		76.3	SURCHARGED	
11.005	S25	29.256	0.016	0.000	1.07		113.1	SURCHARGED	
13.000	SP	29.241	-0.024	0.000	0.94		33.9	OK	
13.001	S21	29.218	0.028	0.000	0.25		8.4	SURCHARGED	
11.006	S22	29.216	0.741	0.000	0.34		13.0	SURCHARGED	
14.000	SP	28.886	0.311	11.224	1.20		43.6	FLOOD	4
15.000	SP	29.203	0.513	0.000	1.15		125.4	SURCHARGED	
14.001	S17	28.941	0.441	0.000	1.75		107.3	SURCHARGED	
14.002	PI IN	28.754	0.284	0.000	1.75		107.5	SURCHARGED	
14.003	PI OUT	28.745	0.325	0.000	0.41		22.8	SURCHARGED	
16.000	SP	28.898	0.158	0.000	1.25		52.8	SURCHARGED	
16.001	S16	28.753	0.103	0.000	1.76		52.7	SURCHARGED	
17.000	S11	29.932	0.987	0.000	1.36		165.2	FLOOD RISK	
18.000	SP	29.722	0.747	0.000	0.66		36.4	FLOOD RISK	
17.001	S12	29.700	0.880	0.000	1.41		189.6	SURCHARGED	
17.002	S13	29.351	0.731	0.000	1.49		192.5	SURCHARGED	
17.003	S14	29.129	0.644	0.000	3.07		328.6	SURCHARGED	
14.004	S15	28.745	1.070	0.000	0.21		9.0	SURCHARGED	
1.011	S6	28.371	0.036	0.000	0.12		79.4	SURCHARGED	
1.012	S7	28.365	0.430	0.000	0.32		79.0	SURCHARGED	
1.013	S8	28.348	0.618	0.000	0.80		80.0	SURCHARGED	
1.014	PI IN	27.487	-0.228	0.000	0.45		80.0	OK	
1.015	PI OUT	27.472	-0.143	0.000	0.81		80.0	OK	

CAPITA

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CS/075666 – Former Nestle Site, Hayes

Preliminary assessment of foul flows

(by G. Males)

Estimate of proposed peak foul flow

Total floor area of warehouse = 19249m2

Total area of offices = 2284m2

21533m2

From Employment Densities Guide 2nd Edition 2010;

Warehouse = 1 person per 40m2 (assuming B1c/B2?)

19249m2 / 40 = 481 persons

Offices = 1 person per 12m2 (General office)

2284m2 / 12 = 190 persons

Total number of persons on site = 481 + 190 = **671 persons**

From British Water – Flows and Loads 2;

flow loading per person per day = 50 litres (office/factory without canteen)

671 x 50 l/p/day = 33550 litres

DWF = 33550 / 12 x 60 x 60 = 0.777 say **0.8 l/sec**

Peak flow = 4 x DWF = 4 x 0.8 = **3.2 l/sec**

Estimate of existing flow

(Refer to Thames Water Trade Effluent Discharge consent).

90m3/hr at point D (Garage)

90 x 1000 = 90,000 litres / hour

90000 / 3600 = **25 l/sec**

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