

Q - Wragg Marsh

528000

531000



Lords Sluice

Lords

330000

330000

327000

327000

R - Lords (S)

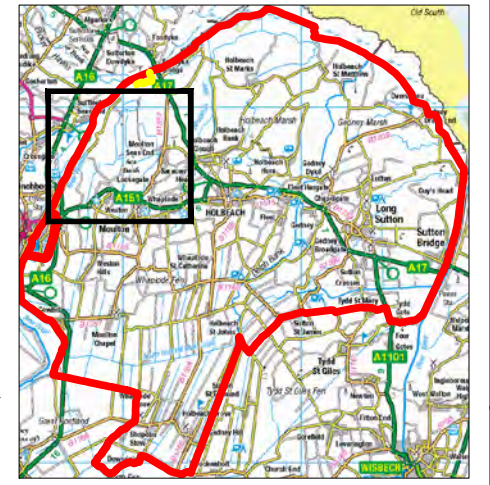
Lords (N)



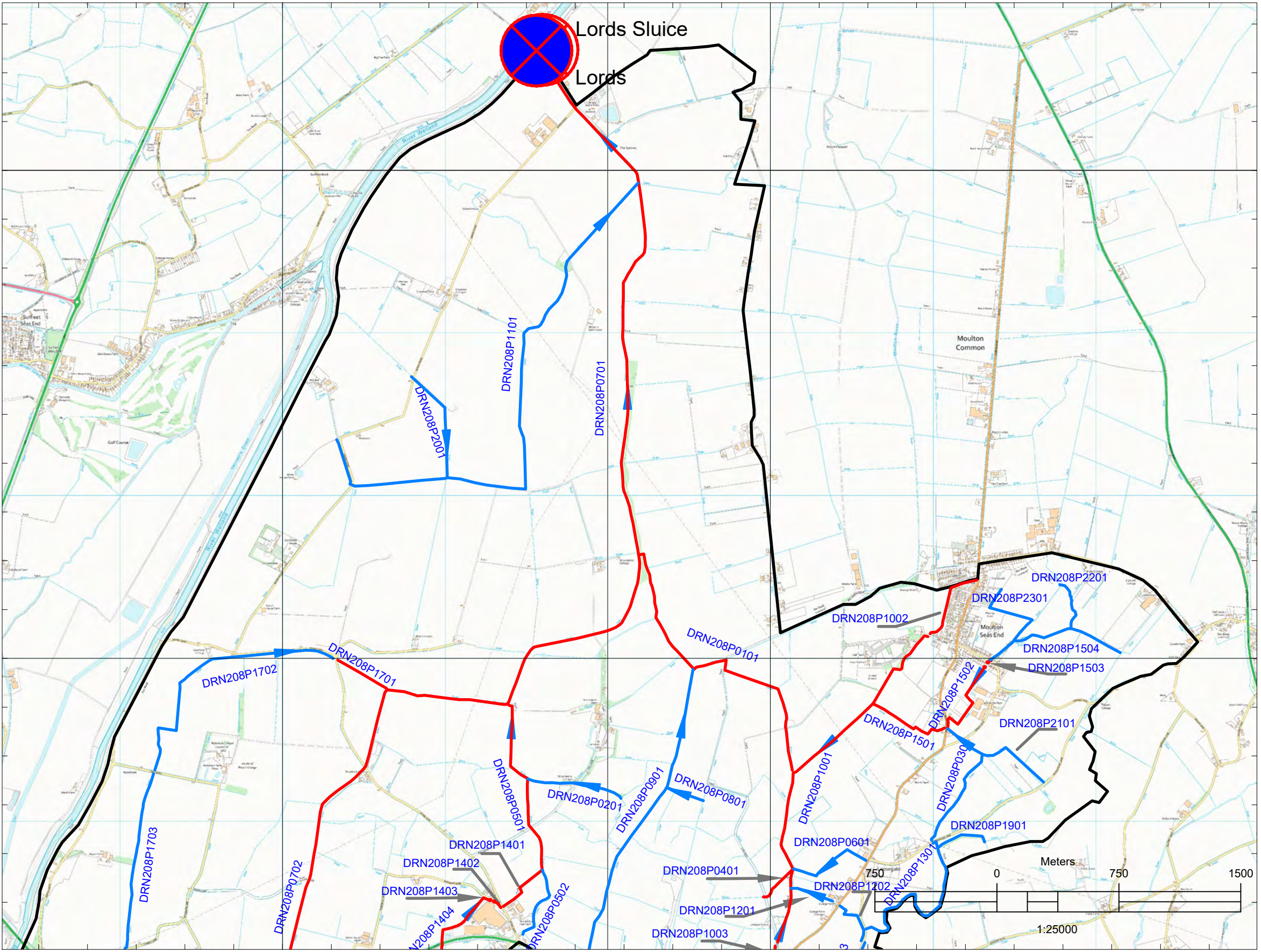
LEGEND

- Catchment Boundary
- High Priority Watercourse
- IDB Ordinary Watercourse
- High Priority Pipeline
- Ordinary Pipeline
- Water Control Structure
- Pumping Station
- Inland Sluice
- Tidal Sluice

KEY MAP



SCALE	SHEET NUMBER
Best fit	© Crown Copyright and database rights [2012]. All rights reserved OS licence number 100029527.
PLOT DATE	CMT208P
03/11/2021	
FILE NAME	
SHIDB_webmap2020.dwg	



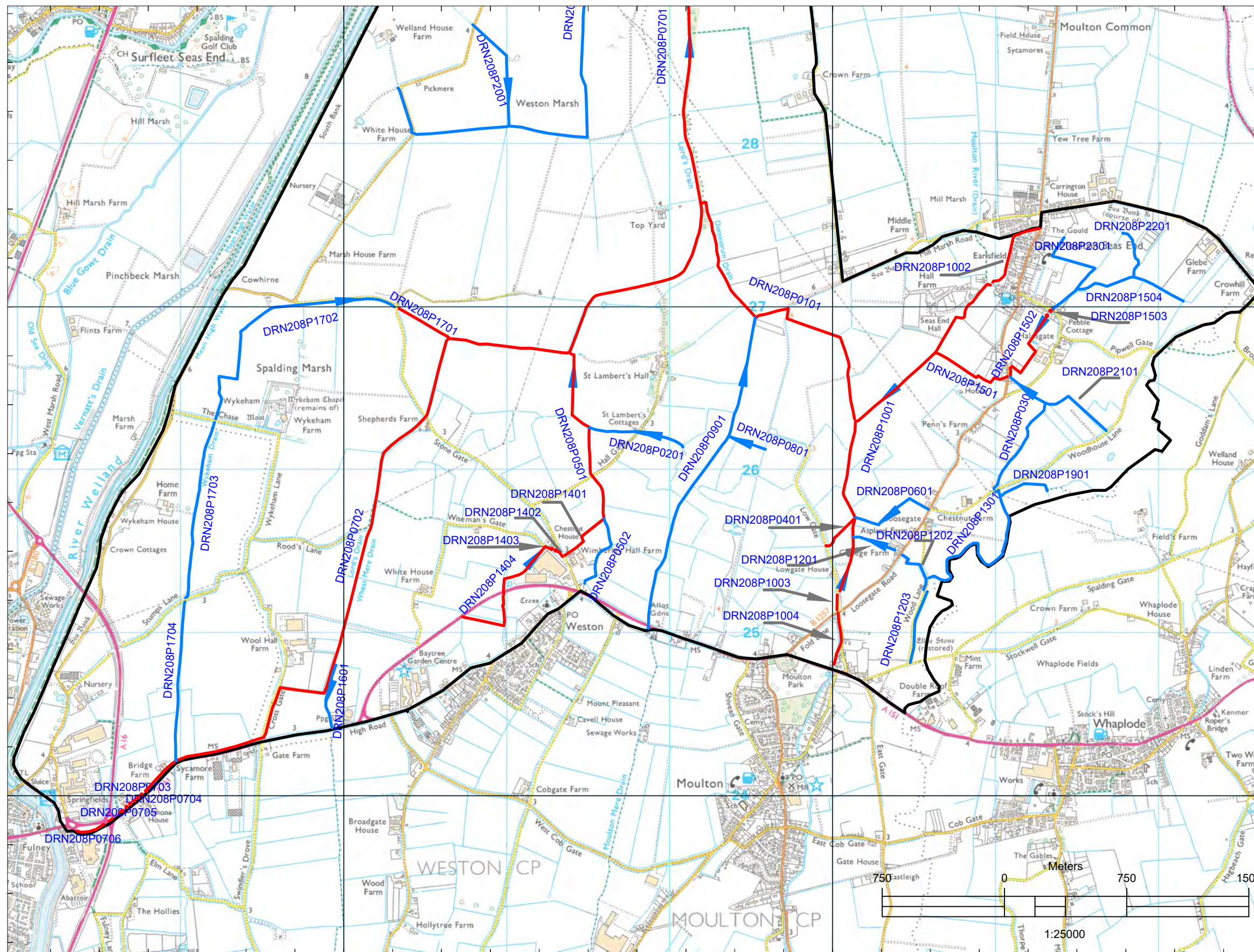
R - Lords (N)

528000

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B - Wisemans

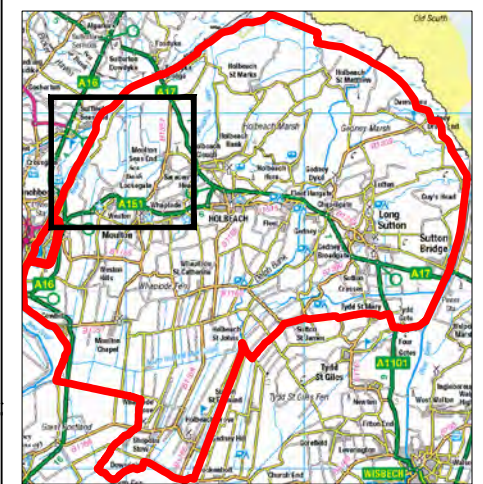
Lords (S)



LEGEND

- Catchment Boundary
- High Priority Watercourse
- IDB Ordinary Watercourse
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- Water Control Structure
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KEY MAP



SCALE	SHEET NUMBER
Best fit	© Crown Copyright and database rights [2012]. All rights reserved OS licence number 100029527. CMT208P
PLOT DATE	
08/02/2023	
FILE NAME	
SHIDB_webmap2020.dwg	

APPENDIX E

DEVELOPMENT PROPOSALS



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Rev	Date	Description	Drawn	CHK'd
A	19.02.25	Roundabout updated to latest	BGL	JDB
B	03.06.25	Landscape plan + areas added	BGL	BL
C	23.06.25	Amended to comments	BGL	BL

APPENDIX F

SURFACE WATER CALCULATIONS

Calculated by:	Matthew Wilson
Site name:	M&S
Site location:	Spalding

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.79676° N
Longitude:	0.1231° W
Reference:	3859342441
Date:	Apr 15 2024 16:21

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):

1

Methodology

 Q_{BAR} estimation method:

Calculate from SPR and SAAR

SPR estimation method:

Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

SOIL type:

Default

2

Edited

2

HOST class:

N/A

N/A

SPR/SPRHOST:

0.3

0.3

Hydrological
characteristics

Default

Edited

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible.

SAAR (mm):	560	560
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Growth curve factor 200 years:	4.21	4.21

Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	1.4	1.4
1 in 1 year (l/s):	1.22	1.22
1 in 30 years (l/s):	3.44	3.44
1 in 100 year (l/s):	5	5
1 in 200 years (l/s):	5.91	5.91

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
RE01	0.004	10.00	3.500	150	0.800
SW02	0.000		3.500	450	0.867
RE03	0.003	10.00	3.450	150	0.800
SW04	0.000		3.350	450	0.800
SW05	0.000		3.400	450	0.894
SW06	0.073	4.00	3.300	450	1.425
RE07	0.011	10.00	3.350	150	0.800
SW08	0.009	4.00	3.220	450	0.800
RE09	0.003	10.00	3.450	150	0.800
SW10	0.010	4.00	3.400	450	0.800
RE11	0.009	10.00	3.300	150	0.800
SW12	0.000	4.00	3.250	450	0.826
SW13	0.008	4.00	3.180	450	1.350
SW14	0.024	4.00	3.000	600	1.425
RE15	0.010	10.00	3.300	150	0.800
SW16	0.000		3.150	450	0.800
RE17	0.007	10.00	3.300	150	0.800
SW18	0.006	4.00	3.300	450	0.916
RE19	0.006	10.00	3.300	150	0.800
SW20	0.016	4.00	3.300	450	0.910
SW21	0.023	4.00	3.250	450	1.096
DN16	0.000		3.150	450	1.141
SW22	0.020	4.00	3.000	1200	1.684
SW23	0.031	4.00	2.950	1200	1.687
RE24	0.026	10.00	3.450	150	0.800
SW25	0.000		3.050	450	0.800
SW26	0.021	4.00	2.900	1200	1.674
RE27	0.046	10.00	3.400	150	0.800
SW28	0.000		3.200	450	1.160
SW29	0.055	4.00	3.200	450	0.800
SW30	0.028	4.00	3.100	600	1.117
SW31	0.000		3.100	600	1.200
DN31	0.000		3.050		1.286
SW32	0.055	4.00	2.950	450	0.800
SW33	0.028	4.00	2.850	600	1.117
SW34	0.000		2.850	600	1.200
SW35	0.000		2.800	1350	1.874
SW36	0.061	4.00	2.850	450	0.800
SW37	0.043	4.00	2.750	600	1.043
SW38	0.000		2.750	600	1.126
DN38	0.000		2.750		1.837
RE39	0.047	10.00	3.200	150	0.800
SW40	0.000		2.750	450	0.800
SW41	0.071	4.00	2.850	1350	2.042
RE42	0.025	10.00	3.300	150	0.800
SW43	0.000		3.150	450	0.872
SW44	0.087	4.00	3.300	600	0.875
DN44	0.000		3.250		1.122
RE45	0.016	10.00	3.150	150	0.800
SW46	0.000		3.050	450	0.881
SW47	0.000		3.250	600	1.245
DN47	0.000		3.200	1350	2.431

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SW48	0.025	4.00	3.100	1350	2.472
RE49	0.022	10.00	2.950	150	0.800
SW50	0.032	4.00	2.950	450	0.867
SW51	0.062	4.00	3.250	600	1.425
RE52	0.036	10.00	3.250	150	0.800
SW53	0.000		3.250	600	1.587
SW54	0.037	4.00	3.250	1500	2.759
SW55	0.000		3.250	1500	2.835
SW56	0.000		3.250	1800	2.866

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RE01	SW02	6.710	0.600	2.700	2.633	0.067	100.1	150	10.11	50.0
1.001	SW02	SW05	8.110	0.600	2.633	2.506	0.127	63.9	150	10.22	49.7
2.000	RE03	SW04	4.200	0.600	2.650	2.550	0.100	42.0	150	10.04	50.2
2.001	SW04	SW05	4.410	0.600	2.550	2.506	0.044	100.2	150	10.12	50.0
1.002	SW05	SW06	8.170	0.600	2.506	1.875	0.631	12.9	150	10.27	49.6
1.003	SW06	SW14	17.620	0.600	1.875	1.650	0.225	78.3	150	10.53	48.9
3.000	RE07	SW08	9.080	0.600	2.550	2.420	0.130	69.8	150	10.13	49.9
3.001	SW08	SW14	8.770	0.600	2.420	1.650	0.770	11.4	150	10.17	49.8
4.000	RE09	SW10	4.190	0.600	2.650	2.600	0.050	83.8	150	10.06	50.1
4.001	SW10	SW13	10.660	0.600	2.600	1.830	0.770	13.8	150	10.13	49.9
5.000	RE11	SW12	7.600	0.600	2.500	2.424	0.076	100.0	150	10.13	49.9
5.001	SW12	SW13	2.680	0.600	2.424	1.830	0.594	4.5	150	10.14	49.9
4.002	SW13	SW14	7.880	0.600	1.830	1.650	0.180	43.8	150	10.22	49.7
1.004	SW14	SW22	31.240	0.600	1.575	1.391	0.184	169.8	225	11.05	47.7
6.000	RE15	SW16	9.120	0.600	2.500	2.350	0.150	60.8	150	10.12	50.0
6.001	SW16	DN16	2.610	0.600	2.350	2.009	0.341	7.7	150	10.13	49.9
7.000	RE17	SW18	11.640	0.600	2.500	2.384	0.116	100.3	150	10.19	49.8

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.004	17.7	0.7	0.650	0.717	0.004	0.0
1.001	1.260	22.3	0.7	0.717	0.744	0.004	0.0
2.000	1.557	27.5	0.5	0.650	0.650	0.003	0.0
2.001	1.003	17.7	0.5	0.650	0.744	0.003	0.0
1.002	2.815	49.7	1.3	0.744	1.275	0.007	0.0
1.003	1.137	20.1	14.1	1.275	1.200	0.080	0.0
3.000	1.204	21.3	2.0	0.650	0.650	0.011	0.0
3.001	3.002	53.0	3.6	0.650	1.200	0.020	0.0
4.000	1.099	19.4	0.5	0.650	0.650	0.003	0.0
4.001	2.721	48.1	2.3	0.650	1.200	0.013	0.0
5.000	1.005	17.8	1.6	0.650	0.676	0.009	0.0
5.001	4.777	84.4	1.6	0.676	1.200	0.009	0.0
4.002	1.525	26.9	5.4	1.200	1.200	0.030	0.0
1.004	1.000	39.8	26.5	1.200	1.384	0.154	0.0
6.000	1.292	22.8	1.8	0.650	0.650	0.010	0.0
6.001	3.665	64.8	1.8	0.650	0.991	0.010	0.0
7.000	1.003	17.7	1.3	0.650	0.766	0.007	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
7.001	SW18	SW21	23.170	0.600	2.384	2.154	0.230	100.7	150	10.58	48.8
8.000	RE19	SW20	11.100	0.600	2.500	2.390	0.110	100.9	150	10.18	49.8
8.001	SW20	SW21	14.240	0.600	2.390	2.154	0.236	60.3	150	10.37	49.3
7.002	SW21	DN16	14.470	0.600	2.154	2.009	0.145	99.8	150	10.82	48.2
6.002	DN16	SW22	6.700	0.600	2.009	1.942	0.067	100.0	150	10.93	47.9
1.005	SW22	SW23	12.920	0.600	1.316	1.263	0.053	243.8	300	11.26	47.2
1.006	SW23	SW26	8.960	0.600	1.263	1.226	0.037	242.2	300	11.41	46.8
9.000	RE24	SW25	29.400	0.600	2.650	2.250	0.400	73.5	150	10.42	49.2
9.001	SW25	SW26	6.920	0.600	2.250	2.100	0.150	46.1	150	10.50	49.0
1.007	SW26	SW35	54.860	0.600	1.226	1.001	0.225	243.8	300	12.32	44.9
10.000	RE27	SW28	56.480	0.600	2.600	2.040	0.560	100.9	150	10.94	47.9
10.001	SW28	DN31	20.110	0.600	2.040	1.839	0.201	100.0	150	11.27	47.1
11.000	SW29	SW30	34.500	0.600	2.400	2.058	0.342	100.9	150	4.57	72.9
11.001	SW30	SW31	13.980	0.600	1.983	1.900	0.083	168.4	225	4.81	71.4
11.002	SW31	DN31	5.720	0.600	1.900	1.764	0.136	42.1	225	4.85	71.1
10.002	DN31	SW35	15.570	0.600	1.764	1.608	0.156	99.8	225	11.47	46.7
12.000	SW32	SW33	34.500	0.600	2.150	1.808	0.342	100.9	150	4.57	72.9
12.001	SW33	SW34	13.980	0.600	1.733	1.650	0.083	168.4	225	4.81	71.4
12.002	SW34	SW35	4.030	0.600	1.650	1.076	0.574	7.0	225	4.82	71.3
1.008	SW35	DN38	4.130	0.600	0.926	0.913	0.013	317.7	375	12.39	44.7
13.000	SW36	SW37	26.990	0.600	2.050	1.782	0.268	100.7	150	4.45	73.7
13.001	SW37	SW38	13.980	0.600	1.707	1.624	0.083	168.4	225	4.68	72.2
13.002	SW38	DN38	4.060	0.600	1.624	1.063	0.561	7.2	225	4.70	72.1
1.009	DN38	SW41	9.550	0.600	0.913	0.883	0.030	318.3	375	12.55	44.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
7.001	1.001	17.7	2.3	0.766	0.946	0.013	0.0
8.000	1.000	17.7	1.1	0.650	0.760	0.006	0.0
8.001	1.297	22.9	3.9	0.760	0.946	0.022	0.0
7.002	1.006	17.8	10.1	0.946	0.991	0.058	0.0
6.002	1.005	17.8	11.8	0.991	0.908	0.068	0.0
1.005	1.002	70.8	41.3	1.384	1.387	0.242	0.0
1.006	1.006	71.1	46.2	1.387	1.374	0.273	0.0
9.000	1.174	20.7	4.6	0.650	0.650	0.026	0.0
9.001	1.485	26.2	4.6	0.650	0.650	0.026	0.0
1.007	1.002	70.8	51.9	1.374	1.499	0.320	0.0
10.000	1.000	17.7	8.0	0.650	1.010	0.046	0.0
10.001	1.004	17.7	7.8	1.010	1.061	0.046	0.0
11.000	1.000	17.7	14.5	0.650	0.892	0.055	0.0
11.001	1.004	39.9	21.4	0.892	0.975	0.083	0.0
11.002	2.022	80.4	21.3	0.975	1.061	0.083	0.0
10.002	1.308	52.0	21.8	1.061	0.967	0.129	0.0
12.000	1.000	17.7	14.5	0.650	0.892	0.055	0.0
12.001	1.004	39.9	21.4	0.892	0.975	0.083	0.0
12.002	4.969	197.6	21.4	0.975	1.499	0.083	0.0
1.008	1.011	111.6	85.9	1.499	1.462	0.532	0.0
13.000	1.001	17.7	16.2	0.650	0.818	0.061	0.0
13.001	1.004	39.9	27.1	0.818	0.901	0.104	0.0
13.002	4.894	194.6	27.1	0.901	1.462	0.104	0.0
1.009	1.010	111.5	102.1	1.462	1.592	0.636	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
14.000	RE39	SW40	41.620	0.600	2.400	1.950	0.450	92.5	150	10.66	48.6
14.001	SW40	SW41	5.910	0.600	1.950	1.891	0.059	100.2	150	10.76	48.3
1.010	SW41	DN47	15.670	0.600	0.808	0.769	0.039	401.8	450	12.81	43.9
15.000	RE42	SW43	22.400	0.600	2.500	2.278	0.222	100.9	150	10.37	49.3
15.001	SW43	DN44	7.530	0.600	2.278	2.203	0.075	100.4	150	10.50	49.0
16.000	SW44	DN44	27.800	0.600	2.425	2.261	0.164	169.5	225	4.46	73.6
15.002	DN44	SW47	20.790	0.600	2.128	2.005	0.123	169.0	225	10.84	48.1
17.000	RE45	SW46	18.210	0.600	2.350	2.169	0.181	100.6	150	10.30	49.5
17.001	SW46	SW47	6.250	0.600	2.169	2.080	0.089	70.2	150	10.39	49.3
15.003	SW47	DN47	2.780	0.600	2.005	1.988	0.017	163.5	225	10.89	48.0
1.011	DN47	SW48	56.410	0.600	0.769	0.628	0.141	400.1	450	13.74	42.2
1.012	SW48	SW54	24.930	0.600	0.628	0.566	0.062	402.1	450	14.15	41.5
18.000	RE49	SW50	6.710	0.600	2.150	2.083	0.067	100.1	150	10.11	50.0
18.001	SW50	SW54	12.680	0.600	2.083	1.957	0.126	100.6	150	10.32	49.4
19.000	SW51	SW53	27.370	0.600	1.825	1.663	0.162	169.0	225	4.45	73.7
20.000	RE52	SW53	19.500	0.600	2.450	1.738	0.712	27.4	150	10.17	49.8
19.001	SW53	SW54	12.680	0.600	1.663	1.588	0.075	169.1	225	10.38	49.3
1.013	SW54	SW55	12.510	0.600	0.491	0.465	0.026	481.2	525	14.36	41.1
1.014	SW55	SW56	3.080	0.600	0.415	0.384	0.031	99.4	150	14.41	41.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
14.000	1.045	18.5	8.3	0.650	0.650	0.047	0.0
14.001	1.004	17.7	8.2	0.650	0.809	0.047	0.0
1.010	1.008	160.3	119.6	1.592	1.981	0.754	0.0
15.000	1.000	17.7	4.5	0.650	0.722	0.025	0.0
15.001	1.003	17.7	4.4	0.722	0.897	0.025	0.0
16.000	1.001	39.8	23.1	0.650	0.764	0.087	0.0
15.002	1.003	39.9	19.5	0.897	1.020	0.112	0.0
17.000	1.002	17.7	2.9	0.650	0.731	0.016	0.0
17.001	1.201	21.2	2.9	0.731	1.020	0.016	0.0
15.003	1.019	40.5	22.2	1.020	0.987	0.128	0.0
1.011	1.010	160.6	134.5	1.981	2.022	0.882	0.0
1.012	1.007	160.2	136.0	2.022	2.234	0.907	0.0
18.000	1.004	17.7	4.0	0.650	0.717	0.022	0.0
18.001	1.001	17.7	9.6	0.717	1.143	0.054	0.0
19.000	1.003	39.9	16.5	1.200	1.362	0.062	0.0
20.000	1.931	34.1	6.5	0.650	1.362	0.036	0.0
19.001	1.002	39.9	17.5	1.362	1.437	0.098	0.0
1.013	1.014	219.5	162.8	2.234	2.260	1.096	0.0
1.014	1.008	17.8	162.8	2.685	2.716	1.096	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	6.710	100.1	150	Circular	3.500	2.700	0.650	3.500	2.633	0.717
1.001	8.110	63.9	150	Circular	3.500	2.633	0.717	3.400	2.506	0.744
2.000	4.200	42.0	150	Circular	3.450	2.650	0.650	3.350	2.550	0.650
2.001	4.410	100.2	150	Circular	3.350	2.550	0.650	3.400	2.506	0.744
1.002	8.170	12.9	150	Circular	3.400	2.506	0.744	3.300	1.875	1.275
1.003	17.620	78.3	150	Circular	3.300	1.875	1.275	3.000	1.650	1.200
3.000	9.080	69.8	150	Circular	3.350	2.550	0.650	3.220	2.420	0.650
3.001	8.770	11.4	150	Circular	3.220	2.420	0.650	3.000	1.650	1.200
4.000	4.190	83.8	150	Circular	3.450	2.650	0.650	3.400	2.600	0.650
4.001	10.660	13.8	150	Circular	3.400	2.600	0.650	3.180	1.830	1.200
5.000	7.600	100.0	150	Circular	3.300	2.500	0.650	3.250	2.424	0.676
5.001	2.680	4.5	150	Circular	3.250	2.424	0.676	3.180	1.830	1.200
4.002	7.880	43.8	150	Circular	3.180	1.830	1.200	3.000	1.650	1.200
1.004	31.240	169.8	225	Circular	3.000	1.575	1.200	3.000	1.391	1.384
6.000	9.120	60.8	150	Circular	3.300	2.500	0.650	3.150	2.350	0.650
6.001	2.610	7.7	150	Circular	3.150	2.350	0.650	3.150	2.009	0.991
7.000	11.640	100.3	150	Circular	3.300	2.500	0.650	3.300	2.384	0.766
7.001	23.170	100.7	150	Circular	3.300	2.384	0.766	3.250	2.154	0.946
8.000	11.100	100.9	150	Circular	3.300	2.500	0.650	3.300	2.390	0.760
8.001	14.240	60.3	150	Circular	3.300	2.390	0.760	3.250	2.154	0.946
7.002	14.470	99.8	150	Circular	3.250	2.154	0.946	3.150	2.009	0.991
6.002	6.700	100.0	150	Circular	3.150	2.009	0.991	3.000	1.942	0.908
1.005	12.920	243.8	300	Circular	3.000	1.316	1.384	2.950	1.263	1.387
1.006	8.960	242.2	300	Circular	2.950	1.263	1.387	2.900	1.226	1.374
9.000	29.400	73.5	150	Circular	3.450	2.650	0.650	3.050	2.250	0.650

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE01	150	Sealed Manhole	Private	SW02	450	Manhole	Private
1.001	SW02	450	Manhole	Private	SW05	450	Manhole	Private
2.000	RE03	150	Sealed Manhole	Private	SW04	450	Manhole	Private
2.001	SW04	450	Manhole	Private	SW05	450	Manhole	Private
1.002	SW05	450	Manhole	Private	SW06	450	Manhole	Private
1.003	SW06	450	Manhole	Private	SW14	600	Manhole	Private
3.000	RE07	150	Sealed Manhole	Private	SW08	450	Manhole	Private
3.001	SW08	450	Manhole	Private	SW14	600	Manhole	Private
4.000	RE09	150	Sealed Manhole	Private	SW10	450	Manhole	Private
4.001	SW10	450	Manhole	Private	SW13	450	Manhole	Private
5.000	RE11	150	Manhole	Private	SW12	450	Manhole	Private
5.001	SW12	450	Manhole	Private	SW13	450	Manhole	Private
4.002	SW13	450	Manhole	Private	SW14	600	Manhole	Private
1.004	SW14	600	Manhole	Private	SW22	1200	Sealed Manhole	Private
6.000	RE15	150	Sealed Manhole	Private	SW16	450	Manhole	Private
6.001	SW16	450	Manhole	Private	DN16	450	Manhole	Private
7.000	RE17	150	Sealed Manhole	Private	SW18	450	Sealed Manhole	Private
7.001	SW18	450	Sealed Manhole	Private	SW21	450	Sealed Manhole	Private
8.000	RE19	150	Sealed Manhole	Private	SW20	450	Sealed Manhole	Private
8.001	SW20	450	Sealed Manhole	Private	SW21	450	Sealed Manhole	Private
7.002	SW21	450	Sealed Manhole	Private	DN16	450	Manhole	Private
6.002	DN16	450	Manhole	Private	SW22	1200	Sealed Manhole	Private
1.005	SW22	1200	Sealed Manhole	Private	SW23	1200	Sealed Manhole	Private
1.006	SW23	1200	Sealed Manhole	Private	SW26	1200	Manhole	Private
9.000	RE24	150	Sealed Manhole	Private	SW25	450	Manhole	Private

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
9.001	6.920	46.1	150	Circular	3.050	2.250	0.650	2.900	2.100	0.650
1.007	54.860	243.8	300	Circular	2.900	1.226	1.374	2.800	1.001	1.499
10.000	56.480	100.9	150	Circular	3.400	2.600	0.650	3.200	2.040	1.010
10.001	20.110	100.0	150	Circular	3.200	2.040	1.010	3.050	1.839	1.061
11.000	34.500	100.9	150	Circular	3.200	2.400	0.650	3.100	2.058	0.892
11.001	13.980	168.4	225	Circular	3.100	1.983	0.892	3.100	1.900	0.975
11.002	5.720	42.1	225	Circular	3.100	1.900	0.975	3.050	1.764	1.061
10.002	15.570	99.8	225	Circular	3.050	1.764	1.061	2.800	1.608	0.967
12.000	34.500	100.9	150	Circular	2.950	2.150	0.650	2.850	1.808	0.892
12.001	13.980	168.4	225	Circular	2.850	1.733	0.892	2.850	1.650	0.975
12.002	4.030	7.0	225	Circular	2.850	1.650	0.975	2.800	1.076	1.499
1.008	4.130	317.7	375	Circular	2.800	0.926	1.499	2.750	0.913	1.462
13.000	26.990	100.7	150	Circular	2.850	2.050	0.650	2.750	1.782	0.818
13.001	13.980	168.4	225	Circular	2.750	1.707	0.818	2.750	1.624	0.901
13.002	4.060	7.2	225	Circular	2.750	1.624	0.901	2.750	1.063	1.462
1.009	9.550	318.3	375	Circular	2.750	0.913	1.462	2.850	0.883	1.592
14.000	41.620	92.5	150	Circular	3.200	2.400	0.650	2.750	1.950	0.650
14.001	5.910	100.2	150	Circular	2.750	1.950	0.650	2.850	1.891	0.809
1.010	15.670	401.8	450	Circular	2.850	0.808	1.592	3.200	0.769	1.981
15.000	22.400	100.9	150	Circular	3.300	2.500	0.650	3.150	2.278	0.722
15.001	7.530	100.4	150	Circular	3.150	2.278	0.722	3.250	2.203	0.897
16.000	27.800	169.5	225	Circular	3.300	2.425	0.650	3.250	2.261	0.764
15.002	20.790	169.0	225	Circular	3.250	2.128	0.897	3.250	2.005	1.020
17.000	18.210	100.6	150	Circular	3.150	2.350	0.650	3.050	2.169	0.731
17.001	6.250	70.2	150	Circular	3.050	2.169	0.731	3.250	2.080	1.020

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
9.001	SW25	450	Manhole	Private	SW26	1200	Manhole	Private
1.007	SW26	1200	Manhole	Private	SW35	1350	Manhole	Private
10.000	RE27	150	Manhole	Private	SW28	450	Manhole	Private
10.001	SW28	450	Manhole	Private	DN31		Junction	
11.000	SW29	450	Manhole	Private	SW30	600	Manhole	Private
11.001	SW30	600	Manhole	Private	SW31	600	Manhole	Private
11.002	SW31	600	Manhole	Private	DN31		Junction	
10.002	DN31		Junction		SW35	1350	Manhole	Private
12.000	SW32	450	Manhole	Private	SW33	600	Manhole	Private
12.001	SW33	600	Manhole	Private	SW34	600	Manhole	Private
12.002	SW34	600	Manhole	Private	SW35	1350	Manhole	Private
1.008	SW35	1350	Manhole	Private	DN38		Junction	
13.000	SW36	450	Manhole	Private	SW37	600	Manhole	Private
13.001	SW37	600	Manhole	Private	SW38	600	Manhole	Private
13.002	SW38	600	Manhole	Private	DN38		Junction	
1.009	DN38		Junction		SW41	1350	Manhole	Private
14.000	RE39	150	Manhole	Private	SW40	450	Manhole	Private
14.001	SW40	450	Manhole	Private	SW41	1350	Manhole	Private
1.010	SW41	1350	Manhole	Private	DN47	1350	Manhole	Private
15.000	RE42	150	Manhole	Private	SW43	450	Manhole	Private
15.001	SW43	450	Manhole	Private	DN44		Junction	
16.000	SW44	600	Manhole	Private	DN44		Junction	
15.002	DN44		Junction		SW47	600	Manhole	Private
17.000	RE45	150	Manhole	Private	SW46	450	Manhole	Private
17.001	SW46	450	Manhole	Private	SW47	600	Manhole	Private

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
15.003	2.780	163.5	225	Circular	3.250	2.005	1.020	3.200	1.988	0.987
1.011	56.410	400.1	450	Circular	3.200	0.769	1.981	3.100	0.628	2.022
1.012	24.930	402.1	450	Circular	3.100	0.628	2.022	3.250	0.566	2.234
18.000	6.710	100.1	150	Circular	2.950	2.150	0.650	2.950	2.083	0.717
18.001	12.680	100.6	150	Circular	2.950	2.083	0.717	3.250	1.957	1.143
19.000	27.370	169.0	225	Circular	3.250	1.825	1.200	3.250	1.663	1.362
20.000	19.500	27.4	150	Circular	3.250	2.450	0.650	3.250	1.738	1.362
19.001	12.680	169.1	225	Circular	3.250	1.663	1.362	3.250	1.588	1.437
1.013	12.510	481.2	525	Circular	3.250	0.491	2.234	3.250	0.465	2.260
1.014	3.080	99.4	150	Circular	3.250	0.415	2.685	3.250	0.384	2.716

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
15.003	SW47	600	Manhole	Private	DN47	1350	Manhole	Private
1.011	DN47	1350	Manhole	Private	SW48	1350	Manhole	Private
1.012	SW48	1350	Manhole	Private	SW54	1500	Manhole	Private
18.000	RE49	150	Sealed Manhole	Private	SW50	450	Manhole	Private
18.001	SW50	450	Manhole	Private	SW54	1500	Manhole	Private
19.000	SW51	600	Manhole	Private	SW53	600	Manhole	Private
20.000	RE52	150	Sealed Manhole	Private	SW53	600	Manhole	Private
19.001	SW53	600	Manhole	Private	SW54	1500	Manhole	Private
1.013	SW54	1500	Manhole	Private	SW55	1500	Manhole	Private
1.014	SW55	1500	Manhole	Private	SW56	1800	Manhole	Private

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE01	3.500	0.800	150				
				0	1.000	2.700	150
SW02	3.500	0.867	450				
				0	1.001	2.633	150
RE03	3.450	0.800	150				
				0	2.000	2.650	150
SW04	3.350	0.800	450				
				0	2.001	2.550	150
SW05	3.400	0.894	450				
				1	2.001	2.506	150
				2	1.001	2.506	150
				0	1.002	2.506	150
SW06	3.300	1.425	450				
				1	1.002	1.875	150
				0	1.003	1.875	150

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
RE07	3.350	0.800	150					
				0	3.000	2.550	150	
SW08	3.220	0.800	450		1	3.000	2.420	150
				0	3.001	2.420	150	
RE09	3.450	0.800	150					
				0	4.000	2.650	150	
SW10	3.400	0.800	450		1	4.000	2.600	150
				0	4.001	2.600	150	
RE11	3.300	0.800	150					
				0	5.000	2.500	150	
SW12	3.250	0.826	450		1	5.000	2.424	150
				0	5.001	2.424	150	
SW13	3.180	1.350	450		1	5.001	1.830	150
				2	4.001	1.830	150	
				0	4.002	1.830	150	
SW14	3.000	1.425	600		1	4.002	1.650	150
				2	3.001	1.650	150	
				3	1.003	1.650	150	
				0	1.004	1.575	225	
RE15	3.300	0.800	150					
				0	6.000	2.500	150	
SW16	3.150	0.800	450		1	6.000	2.350	150
				0	6.001	2.350	150	
RE17	3.300	0.800	150					
				0	7.000	2.500	150	
SW18	3.300	0.916	450		1	7.000	2.384	150
				0	7.001	2.384	150	
RE19	3.300	0.800	150					
				0	8.000	2.500	150	

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW20	3.300	0.910	450	1	8.000	2.390	150
				0	8.001	2.390	150
SW21	3.250	1.096	450	1	8.001	2.154	150
				2	7.001	2.154	150
				0	7.002	2.154	150
DN16	3.150	1.141	450	1	7.002	2.009	150
				2	6.001	2.009	150
				0	6.002	2.009	150
SW22	3.000	1.684	1200	1	6.002	1.942	150
				2	1.004	1.391	225
				0	1.005	1.316	300
SW23	2.950	1.687	1200	1	1.005	1.263	300
				0	1.006	1.263	300
RE24	3.450	0.800	150	0	9.000	2.650	150
SW25	3.050	0.800	450	1	9.000	2.250	150
				0	9.001	2.250	150
SW26	2.900	1.674	1200	1	9.001	2.100	150
				2	1.006	1.226	300
				0	1.007	1.226	300
RE27	3.400	0.800	150	0	10.000	2.600	150
SW28	3.200	1.160	450	1	10.000	2.040	150
				0	10.001	2.040	150
SW29	3.200	0.800	450	0	11.000	2.400	150
SW30	3.100	1.117	600	1	11.000	2.058	150
				0	11.001	1.983	225
SW31	3.100	1.200	600	1	11.001	1.900	225
				0	11.002	1.900	225

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
DN31	3.050	1.286		1	11.002	1.764	225
				2	10.001	1.839	150
				0	10.002	1.764	225
SW32	2.950	0.800	450				
				0	12.000	2.150	150
SW33	2.850	1.117	600	1	12.000	1.808	150
				0	12.001	1.733	225
SW34	2.850	1.200	600	1	12.001	1.650	225
				0	12.002	1.650	225
SW35	2.800	1.874	1350	1	12.002	1.076	225
				2	10.002	1.608	225
				3	1.007	1.001	300
				0	1.008	0.926	375
SW36	2.850	0.800	450				
				0	13.000	2.050	150
SW37	2.750	1.043	600	1	13.000	1.782	150
				0	13.001	1.707	225
SW38	2.750	1.126	600	1	13.001	1.624	225
				0	13.002	1.624	225
DN38	2.750	1.837		1	13.002	1.063	225
				2	1.008	0.913	375
				0	1.009	0.913	375
RE39	3.200	0.800	150				
				0	14.000	2.400	150
SW40	2.750	0.800	450	1	14.000	1.950	150
				0	14.001	1.950	150
SW41	2.850	2.042	1350	1	14.001	1.891	150
				2	1.009	0.883	375
				0	1.010	0.808	450
RE42	3.300	0.800	150				
				0	15.000	2.500	150

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW43	3.150	0.872	450	1	15.000	2.278	150
				0	15.001	2.278	150
SW44	3.300	0.875	600	0	16.000	2.425	225
DN44	3.250	1.122		1	16.000	2.261	225
				2	15.001	2.203	150
				0	15.002	2.128	225
RE45	3.150	0.800	150	0	17.000	2.350	150
SW46	3.050	0.881	450	1	17.000	2.169	150
				0	17.001	2.169	150
SW47	3.250	1.245	600	1	17.001	2.080	150
				2	15.002	2.005	225
				0	15.003	2.005	225
DN47	3.200	2.431	1350	1	15.003	1.988	225
				2	1.010	0.769	450
				0	1.011	0.769	450
SW48	3.100	2.472	1350	1	1.011	0.628	450
				0	1.012	0.628	450
RE49	2.950	0.800	150	0	18.000	2.150	150
SW50	2.950	0.867	450	1	18.000	2.083	150
				0	18.001	2.083	150
SW51	3.250	1.425	600	0	19.000	1.825	225
RE52	3.250	0.800	150	0	20.000	2.450	150
SW53	3.250	1.587	600	1	20.000	1.738	150
				2	19.000	1.663	225
				0	19.001	1.663	225

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW54	3.250	2.759	1500		1	19.001	1.588 225
					2	18.001	1.957 150
					3	1.012	0.566 450
					0	1.013	0.491 525
SW55	3.250	2.835	1500		1	1.013	0.465 525
					0	1.014	0.415 150
SW56	3.250	2.866	1800		1	1.014	0.384 150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	360
M5-60 (mm)	20.000	Additional Storage (m³/ha)	0.0
Ratio-R	0.400	Starting Level (m)	
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160
30	120	240	480	720	1440	2880

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	25	0	0
100	25	0	0

Node SW55 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	0.415	Product Number	CTL-SHE-0055-2000-2400-2000
Design Depth (m)	2.400	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node RE03 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.650	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	8	Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	5.000		

Node RE07 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.550	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	8	Depth (m)	0.350
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	8.600		

Node RE09 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.650	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	5.000		

Node RE11 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.500	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	11	Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	8.660		

Node RE15 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.500	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	8	Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Node RE24 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.650	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.672	Inf Depth (m)	
Porosity	0.30	Length (m)	30.500		

Node RE27 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.600	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	57.600		

Node SW29 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.400	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.900
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.95	Length (m)	32.600		

Node SW30 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.983	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.900
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.95	Length (m)	15.000		

Node SW32 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.150	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.900
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.95	Length (m)	32.600		

Node SW33 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.733	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.900
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.95	Length (m)	15.000		

Node SW36 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.050	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.900
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.95	Length (m)	20.000		

Node SW37 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.707	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.900
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.95	Length (m)	15.000		

Node RE39 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.400	Slope (1:X)	253.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	42.500		

Node RE42 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.500	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	23.500		

Node SW54 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.491
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	140.0	0.0	1.200	140.0	0.0	1.201	0.0	0.0

Node RE01 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.700	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	8	Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	7.500		

Node RE45 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.350	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	18.600		

Node RE49 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.150	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	7.500		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	RE01	21	2.718	0.018	0.5	0.0256	0.0000	OK
30 minute summer	SW02	21	2.649	0.016	0.5	0.0026	0.0000	OK
30 minute summer	RE03	21	2.662	0.012	0.4	0.0220	0.0000	OK
30 minute summer	SW04	21	2.565	0.015	0.3	0.0024	0.0000	OK
30 minute summer	SW05	21	2.520	0.014	0.8	0.0022	0.0000	OK
15 minute summer	SW06	10	1.978	0.103	15.1	0.0164	0.0000	OK
30 minute summer	RE07	23	2.575	0.025	1.3	0.1910	0.0000	OK
15 minute summer	SW08	10	2.442	0.022	2.6	0.0036	0.0000	OK
30 minute summer	RE09	21	2.664	0.014	0.4	0.0297	0.0000	OK
15 minute summer	SW10	10	2.622	0.022	2.2	0.0035	0.0000	OK
30 minute summer	RE11	22	2.527	0.027	1.1	0.1111	0.0000	OK
30 minute summer	SW12	22	2.436	0.012	1.0	0.0018	0.0000	OK
960 minute winter	SW13	930	1.873	0.043	0.3	0.0069	0.0000	OK
960 minute winter	SW14	915	1.873	0.298	1.7	0.0844	0.0000	SURCHARGED
30 minute summer	RE15	21	2.525	0.025	1.2	0.0987	0.0000	OK
30 minute summer	SW16	21	2.364	0.014	1.2	0.0022	0.0000	OK
15 minute summer	RE17	13	2.522	0.022	0.8	0.0004	0.0000	OK
15 minute summer	SW18	10	2.417	0.033	2.0	0.0053	0.0000	OK
15 minute summer	RE19	13	2.520	0.020	0.7	0.0004	0.0000	OK
15 minute summer	SW20	10	2.432	0.042	3.9	0.0066	0.0000	OK
15 minute summer	SW21	10	2.241	0.087	10.4	0.0138	0.0000	OK
15 minute summer	DN16	10	2.103	0.094	11.1	0.0150	0.0000	OK
960 minute winter	SW22	915	1.873	0.557	2.8	0.6301	0.0000	SURCHARGED
960 minute winter	SW23	915	1.873	0.610	3.2	0.6901	0.0000	SURCHARGED
30 minute summer	RE24	22	2.689	0.039	3.0	0.2635	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	RE01	1.000	SW02	0.5	0.456	0.028	0.0073	
30 minute summer	SW02	1.001	SW05	0.5	0.549	0.022	0.0073	
30 minute summer	RE03	2.000	SW04	0.3	0.455	0.012	0.0033	
30 minute summer	SW04	2.001	SW05	0.3	0.406	0.019	0.0037	
30 minute summer	SW05	1.002	SW06	0.8	0.361	0.017	0.0493	
15 minute summer	SW06	1.003	SW14	15.0	1.210	0.748	0.2189	
30 minute summer	RE07	3.000	SW08	1.1	0.738	0.054	0.0144	
15 minute summer	SW08	3.001	SW14	2.6	1.310	0.048	0.0391	
30 minute summer	RE09	4.000	SW10	0.3	0.418	0.017	0.0045	
15 minute summer	SW10	4.001	SW13	2.2	0.823	0.047	0.0297	
30 minute summer	RE11	5.000	SW12	1.0	0.760	0.056	0.0105	
30 minute summer	SW12	5.001	SW13	1.0	0.700	0.012	0.0056	
960 minute winter	SW13	4.002	SW14	0.3	0.502	0.011	0.0858	
960 minute winter	SW14	1.004	SW22	1.7	0.501	0.043	1.2424	
30 minute summer	RE15	6.000	SW16	1.2	0.856	0.051	0.0127	
30 minute summer	SW16	6.001	DN16	1.2	0.366	0.018	0.0148	
15 minute summer	RE17	7.000	SW18	0.8	0.464	0.045	0.0259	
15 minute summer	SW18	7.001	SW21	1.9	0.343	0.109	0.1559	
15 minute summer	RE19	8.000	SW20	0.7	0.426	0.040	0.0298	
15 minute summer	SW20	8.001	SW21	3.9	0.542	0.168	0.1033	
15 minute summer	SW21	7.002	DN16	10.3	0.925	0.578	0.1606	
15 minute summer	DN16	6.002	SW22	11.0	1.001	0.618	0.0736	
960 minute winter	SW22	1.005	SW23	2.8	0.454	0.040	0.9098	
960 minute winter	SW23	1.006	SW26	3.2	0.474	0.045	0.6310	
30 minute summer	RE24	9.000	SW25	2.9	0.861	0.141	0.1000	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	SW25	22	2.285	0.035	2.9	0.0056	0.0000	OK
960 minute winter	SW26	915	1.873	0.647	3.8	0.7319	0.0000	SURCHARGED
30 minute summer	RE27	22	2.656	0.056	5.4	0.4741	0.0000	OK
30 minute summer	SW28	23	2.096	0.056	5.2	0.0089	0.0000	OK
30 minute summer	SW29	21	2.451	0.051	9.5	2.5215	0.0000	OK
60 minute summer	SW30	41	2.037	0.054	6.9	2.8294	0.0000	OK
60 minute summer	SW31	41	1.937	0.037	4.7	0.0104	0.0000	OK
960 minute winter	DN31	915	1.873	0.109	1.6	0.0000	0.0000	OK
30 minute summer	SW32	21	2.201	0.051	9.5	2.5215	0.0000	OK
960 minute winter	SW33	915	1.873	0.140	1.9	14.6721	0.0000	OK
960 minute winter	SW34	915	1.873	0.223	1.5	0.0632	0.0000	OK
960 minute winter	SW35	915	1.873	0.947	6.4	1.3554	0.0000	SURCHARGED
30 minute summer	SW36	21	2.105	0.055	10.6	2.8461	0.0000	OK
960 minute winter	SW37	915	1.873	0.166	3.7	18.3845	0.0000	OK
960 minute winter	SW38	915	1.873	0.249	3.0	0.0705	0.0000	SURCHARGED
960 minute winter	DN38	915	1.873	0.960	6.9	0.0000	0.0000	SURCHARGED
30 minute summer	RE39	22	2.454	0.054	5.5	0.5639	0.0000	OK
30 minute summer	SW40	22	2.010	0.060	5.2	0.0095	0.0000	OK
960 minute winter	SW41	915	1.873	1.065	8.2	1.5242	0.0000	SURCHARGED
30 minute summer	RE42	22	2.541	0.041	2.9	0.2565	0.0000	OK
30 minute summer	SW43	22	2.319	0.041	2.8	0.0066	0.0000	OK
15 minute summer	SW44	10	2.530	0.105	17.3	0.0297	0.0000	OK
15 minute summer	DN44	10	2.240	0.112	19.2	0.0000	0.0000	OK
30 minute summer	RE45	21	2.383	0.033	1.9	0.1674	0.0000	OK
30 minute summer	SW46	22	2.200	0.031	1.8	0.0049	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	SW25	9.001	SW26	2.9	0.953	0.111	0.0212	
960 minute winter	SW26	1.007	SW35	3.8	0.535	0.054	3.8632	
30 minute summer	RE27	10.000	SW28	5.2	0.866	0.292	0.3367	
30 minute summer	SW28	10.001	DN31	5.1	0.867	0.289	0.1188	
30 minute summer	SW29	11.000	SW30	4.4	0.826	0.246	0.1820	
60 minute summer	SW30	11.001	SW31	4.7	0.815	0.117	0.0809	
60 minute summer	SW31	11.002	DN31	4.7	0.788	0.058	0.0387	
960 minute winter	DN31	10.002	SW35	1.6	0.592	0.031	0.4582	
30 minute summer	SW32	12.000	SW33	4.4	0.826	0.246	0.1820	
960 minute winter	SW33	12.001	SW34	-1.4	0.612	-0.036	0.4593	
960 minute winter	SW34	12.002	SW35	-1.5	1.235	-0.007	0.1602	
960 minute winter	SW35	1.008	DN38	5.6	0.468	0.050	0.4555	
30 minute summer	SW36	13.000	SW37	4.8	0.848	0.274	0.1542	
960 minute winter	SW37	13.001	SW38	-2.9	0.657	-0.073	0.4977	
960 minute winter	SW38	13.002	DN38	-3.0	1.326	-0.015	0.1615	
960 minute winter	DN38	1.009	SW41	6.7	0.572	0.060	1.0533	
30 minute summer	RE39	14.000	SW40	5.2	0.846	0.281	0.2555	
30 minute summer	SW40	14.001	SW41	5.2	0.832	0.291	0.0367	
960 minute winter	SW41	1.010	DN47	7.9	0.459	0.050	2.4828	
30 minute summer	RE42	15.000	SW43	2.8	0.720	0.160	0.0881	
30 minute summer	SW43	15.001	DN44	2.8	0.727	0.160	0.0293	
15 minute summer	SW44	16.000	DN44	17.3	0.968	0.435	0.4975	
15 minute summer	DN44	15.002	SW47	19.2	0.892	0.482	0.4478	
30 minute summer	RE45	17.000	SW46	1.8	0.662	0.102	0.0498	
30 minute summer	SW46	17.001	SW47	1.8	0.715	0.085	0.0206	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW47	10	2.133	0.128	20.5	0.0361	0.0000	OK
960 minute winter	DN47	915	1.873	1.104	9.5	1.5800	0.0000	SURCHARGED
960 minute winter	SW48	915	1.873	1.245	9.7	1.7818	0.0000	SURCHARGED
15 minute summer	RE49	15	2.189	0.039	2.5	0.2243	0.0000	OK
15 minute summer	SW50	10	2.159	0.076	8.3	0.0121	0.0000	OK
15 minute summer	SW51	10	1.911	0.086	12.3	0.0243	0.0000	OK
30 minute summer	RE52	21	2.486	0.036	4.2	0.0007	0.0000	OK
960 minute winter	SW53	915	1.873	0.210	1.2	0.0595	0.0000	OK
960 minute winter	SW54	915	1.873	1.382	12.0	162.1087	0.0000	SURCHARGED
960 minute winter	SW55	915	1.873	1.458	1.6	2.5765	0.0000	SURCHARGED
960 minute winter	SW56	915	0.414	0.030	1.6	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW47	15.003	DN47	20.2	0.945	0.498	0.0594	
960 minute winter	DN47	1.011	SW48	9.4	0.413	0.059	8.9378	
960 minute winter	SW48	1.012	SW54	9.6	0.402	0.060	3.9500	
15 minute summer	RE49	18.000	SW50	2.4	0.599	0.134	0.0397	
15 minute summer	SW50	18.001	SW54	8.2	0.954	0.465	0.1094	
15 minute summer	SW51	19.000	SW53	12.3	0.772	0.310	0.4409	
30 minute summer	RE52	20.000	SW53	4.2	1.299	0.123	0.0630	
960 minute winter	SW53	19.001	SW54	1.6	0.448	0.039	0.4970	
960 minute winter	SW54	1.013	SW55	1.6	0.312	0.007	2.7026	
960 minute winter	SW55	1.014	SW56	1.6	0.596	0.089	0.0082	103.4

Results for 30 year +25% CC Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE01	13	2.858	0.158	8.4	1.3626	0.0000	SURCHARGED
15 minute summer	SW02	13	2.851	0.218	7.4	0.0346	0.0000	SURCHARGED
15 minute summer	RE03	12	2.858	0.208	11.7	1.4713	0.0000	SURCHARGED
15 minute summer	SW04	12	2.854	0.304	11.3	0.0483	0.0000	SURCHARGED
15 minute summer	SW05	12	2.849	0.343	18.7	0.0545	0.0000	SURCHARGED
15 minute summer	SW06	10	2.942	1.067	44.5	0.1696	0.0000	SURCHARGED
15 minute summer	RE07	12	2.606	0.056	6.5	0.8843	0.0000	OK
15 minute summer	SW08	11	2.607	0.187	7.9	0.0297	0.0000	SURCHARGED
30 minute summer	RE09	22	2.675	0.025	1.1	0.0923	0.0000	OK
15 minute summer	SW10	10	2.638	0.038	6.9	0.0061	0.0000	OK
30 minute summer	RE11	21	2.614	0.114	7.4	1.1994	0.0000	OK
30 minute summer	SW12	21	2.610	0.186	7.6	0.0296	0.0000	SURCHARGED
30 minute summer	SW13	21	2.607	0.777	11.3	0.1236	0.0000	SURCHARGED
15 minute summer	SW14	11	2.604	1.029	55.9	0.2911	0.0000	SURCHARGED
2160 minute winter	RE15	2100	2.560	0.060	0.2	0.5249	0.0000	OK
2160 minute winter	SW16	2100	2.560	0.210	0.2	0.0334	0.0000	SURCHARGED
15 minute summer	RE17	12	2.793	0.293	3.0	0.0053	0.0000	SURCHARGED
15 minute summer	SW18	12	2.783	0.399	5.7	0.0635	0.0000	SURCHARGED
15 minute summer	RE19	12	2.802	0.302	2.1	0.0054	0.0000	SURCHARGED
15 minute summer	SW20	12	2.798	0.408	11.4	0.0649	0.0000	SURCHARGED
15 minute summer	SW21	12	2.762	0.608	24.5	0.0966	0.0000	SURCHARGED
2160 minute winter	DN16	2100	2.560	0.551	1.2	0.0876	0.0000	SURCHARGED
2160 minute winter	SW22	2100	2.560	1.244	4.2	1.4067	0.0000	SURCHARGED
2160 minute winter	SW23	2100	2.560	1.297	4.7	1.4666	0.0000	SURCHARGED
30 minute summer	RE24	22	2.722	0.072	9.3	0.8816	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE01	1.000	SW02	-7.0	0.755	-0.392	0.1181	
15 minute summer	SW02	1.001	SW05	8.0	0.664	0.361	0.1428	
15 minute summer	RE03	2.000	SW04	-10.7	0.695	-0.388	0.0739	
15 minute summer	SW04	2.001	SW05	-11.3	0.727	-0.638	0.0776	
15 minute summer	SW05	1.002	SW06	-18.7	-1.063	-0.376	0.1438	
15 minute summer	SW06	1.003	SW14	27.5	1.561	1.368	0.3102	
15 minute summer	RE07	3.000	SW08	5.7	1.062	0.270	0.1069	
15 minute summer	SW08	3.001	SW14	8.1	1.193	0.153	0.1544	
30 minute summer	RE09	4.000	SW10	1.0	0.587	0.054	0.0100	
15 minute summer	SW10	4.001	SW13	6.9	1.013	0.143	0.1128	
30 minute summer	RE11	5.000	SW12	7.6	0.904	0.427	0.1215	
30 minute summer	SW12	5.001	SW13	8.3	0.472	0.098	0.0472	
30 minute summer	SW13	4.002	SW14	11.7	1.009	0.433	0.1387	
15 minute summer	SW14	1.004	SW22	49.4	1.242	1.242	1.2424	
2160 minute winter	RE15	6.000	SW16	0.2	0.502	0.009	0.1101	
2160 minute winter	SW16	6.001	DN16	0.2	0.223	0.003	0.0459	
15 minute summer	RE17	7.000	SW18	3.8	0.541	0.215	0.2049	
15 minute summer	SW18	7.001	SW21	6.1	0.360	0.343	0.4079	
15 minute summer	RE19	8.000	SW20	3.6	0.570	0.203	0.1954	
15 minute summer	SW20	8.001	SW21	8.9	0.617	0.390	0.2507	
15 minute summer	SW21	7.002	DN16	21.2	1.203	1.191	0.2547	
2160 minute winter	DN16	6.002	SW22	1.2	0.519	0.065	0.1180	
2160 minute winter	SW22	1.005	SW23	4.2	0.438	0.060	0.9098	
2160 minute winter	SW23	1.006	SW26	4.7	0.412	0.066	0.6310	
30 minute summer	RE24	9.000	SW25	8.9	1.189	0.429	0.2360	

Results for 30 year +25% CC Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	SW25	2100	2.560	0.310	0.4	0.0493	0.0000	SURCHARGED
2160 minute winter	SW26	2100	2.560	1.334	5.5	1.5085	0.0000	SURCHARGED
30 minute summer	RE27	23	2.709	0.109	16.4	1.7856	0.0000	OK
2160 minute winter	SW28	2100	2.560	0.520	0.8	0.0826	0.0000	SURCHARGED
2160 minute winter	SW29	2100	2.560	0.160	1.0	24.2807	0.0000	SURCHARGED
2160 minute winter	SW30	2100	2.560	0.577	5.2	77.0106	0.0000	SURCHARGED
2160 minute winter	SW31	2100	2.560	0.660	3.9	0.1867	0.0000	SURCHARGED
2160 minute winter	DN31	2100	2.560	0.796	3.9	0.0000	0.0000	SURCHARGED
2160 minute winter	SW32	2100	2.560	0.410	4.5	101.7346	0.0000	SURCHARGED
2160 minute winter	SW33	2100	2.560	0.827	6.4	112.7057	0.0000	FLOOD RISK
2160 minute winter	SW34	2100	2.560	0.910	5.4	0.2575	0.0000	FLOOD RISK
2160 minute winter	SW35	2100	2.560	1.634	6.7	2.3379	0.0000	FLOOD RISK
2160 minute winter	SW36	2100	2.560	0.510	4.7	87.4401	0.0000	FLOOD RISK
2160 minute winter	SW37	2100	2.560	0.853	7.4	116.4163	0.0000	FLOOD RISK
2160 minute winter	SW38	2100	2.560	0.936	6.4	0.2648	0.0000	FLOOD RISK
2160 minute winter	DN38	2100	2.560	1.647	6.5	0.0000	0.0000	FLOOD RISK
2160 minute winter	RE39	2100	2.560	0.160	0.8	4.8538	0.0000	SURCHARGED
2160 minute winter	SW40	2100	2.560	0.610	0.8	0.0969	0.0000	FLOOD RISK
2160 minute winter	SW41	2100	2.560	1.752	6.8	2.5068	0.0000	FLOOD RISK
15 minute summer	RE42	12	2.578	0.078	8.7	0.9175	0.0000	OK
15 minute summer	SW43	10	2.565	0.287	9.5	0.0457	0.0000	SURCHARGED
15 minute summer	SW44	10	2.873	0.448	53.0	0.1269	0.0000	SURCHARGED
15 minute summer	DN44	10	2.561	0.433	55.9	0.0000	0.0000	SURCHARGED
2160 minute winter	RE45	2100	2.560	0.210	0.3	4.5629	0.0000	SURCHARGED
2160 minute winter	SW46	2100	2.560	0.391	0.3	0.0621	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	SW25	9.001	SW26	0.4	0.539	0.015	0.1218	
2160 minute winter	SW26	1.007	SW35	5.5	0.442	0.077	3.8632	
30 minute summer	RE27	10.000	SW28	15.2	1.108	0.857	0.8243	
2160 minute winter	SW28	10.001	DN31	0.8	0.466	0.043	0.3540	
2160 minute winter	SW29	11.000	SW30	0.9	0.523	0.051	0.6074	
2160 minute winter	SW30	11.001	SW31	-3.8	0.521	-0.095	0.5560	
2160 minute winter	SW31	11.002	DN31	-3.9	0.472	-0.048	0.2275	
2160 minute winter	DN31	10.002	SW35	-3.4	0.564	-0.065	0.6192	
2160 minute winter	SW32	12.000	SW33	-3.7	0.485	-0.209	0.6074	
2160 minute winter	SW33	12.001	SW34	-5.4	0.584	-0.134	0.5560	
2160 minute winter	SW34	12.002	SW35	-5.4	1.043	-0.027	0.1603	
2160 minute winter	SW35	1.008	DN38	4.4	0.351	0.039	0.4555	
2160 minute winter	SW36	13.000	SW37	-3.7	0.504	-0.208	0.4752	
2160 minute winter	SW37	13.001	SW38	-6.4	0.632	-0.161	0.5560	
2160 minute winter	SW38	13.002	DN38	-6.4	1.128	-0.033	0.1615	
2160 minute winter	DN38	1.009	SW41	5.5	0.446	0.049	1.0533	
2160 minute winter	RE39	14.000	SW40	0.8	0.497	0.043	0.7327	
2160 minute winter	SW40	14.001	SW41	0.8	0.459	0.044	0.1040	
2160 minute winter	SW41	1.010	DN47	6.7	0.352	0.042	2.4828	
15 minute summer	RE42	15.000	SW43	9.5	0.957	0.538	0.3010	
15 minute summer	SW43	15.001	DN44	11.9	0.979	0.671	0.1326	
15 minute summer	SW44	16.000	DN44	51.8	1.302	1.300	1.1056	
15 minute summer	DN44	15.002	SW47	54.9	1.381	1.378	0.8268	
2160 minute winter	RE45	17.000	SW46	0.3	0.398	0.017	0.3206	
2160 minute winter	SW46	17.001	SW47	0.3	0.424	0.014	0.1100	

Results for 30 year +25% CC Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	SW47	2100	2.560	0.555	2.1	0.1570	0.0000	SURCHARGED
2160 minute winter	DN47	2100	2.560	1.791	8.0	2.5626	0.0000	SURCHARGED
2160 minute winter	SW48	2100	2.560	1.932	8.3	2.7643	0.0000	SURCHARGED
2160 minute winter	RE49	2100	2.560	0.410	0.4	3.7387	0.0000	SURCHARGED
2160 minute winter	SW50	2100	2.560	0.477	0.9	0.0758	0.0000	SURCHARGED
60 minute summer	SW51	37	2.578	0.753	23.4	0.2131	0.0000	SURCHARGED
2160 minute winter	RE52	2100	2.560	0.110	0.6	0.0020	0.0000	OK
2160 minute winter	SW53	2100	2.560	0.897	1.7	0.2538	0.0000	SURCHARGED
2160 minute winter	SW54	2100	2.560	2.069	10.2	163.3220	0.0000	SURCHARGED
2160 minute winter	SW55	2100	2.560	2.145	1.9	3.7898	0.0000	SURCHARGED
2160 minute winter	SW56	2100	0.417	0.033	1.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	SW47	15.003	DN47	2.1	0.501	0.051	0.1106	
2160 minute winter	DN47	1.011	SW48	8.0	0.377	0.050	8.9378	
2160 minute winter	SW48	1.012	SW54	8.2	0.420	0.051	3.9500	
2160 minute winter	RE49	18.000	SW50	0.4	0.302	0.022	0.1181	
2160 minute winter	SW50	18.001	SW54	0.9	0.505	0.051	0.2232	
60 minute summer	SW51	19.000	SW53	23.3	0.853	0.584	1.0885	
2160 minute winter	RE52	20.000	SW53	0.6	0.647	0.018	0.3062	
2160 minute winter	SW53	19.001	SW54	1.9	0.437	0.048	0.5043	
2160 minute winter	SW54	1.013	SW55	1.9	0.318	0.009	2.7026	
2160 minute winter	SW55	1.014	SW56	1.9	0.625	0.106	0.0093	232.6

Results for 100 year +25% CC Critical Storm Duration. Lowest mass balance: 98.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	RE01	22	3.008	0.308	12.1	3.0471	0.0000	SURCHARGED
30 minute summer	SW02	22	3.003	0.370	11.4	0.0588	0.0000	SURCHARGED
15 minute summer	RE03	12	3.016	0.366	14.9	2.5428	0.0000	SURCHARGED
15 minute summer	SW04	12	3.002	0.452	14.7	0.0719	0.0000	SURCHARGED
30 minute summer	SW05	21	2.997	0.491	24.2	0.0780	0.0000	SURCHARGED
15 minute summer	SW06	10	3.232	1.357	57.8	0.2158	0.0000	FLOOD RISK
60 minute summer	RE07	42	2.786	0.236	13.0	5.5277	0.0000	SURCHARGED
60 minute summer	SW08	42	2.782	0.362	8.7	0.0576	0.0000	SURCHARGED
60 minute summer	RE09	42	2.787	0.137	4.4	0.9377	0.0000	OK
60 minute summer	SW10	42	2.787	0.187	6.0	0.0297	0.0000	SURCHARGED
60 minute summer	RE11	42	2.788	0.288	9.8	3.4483	0.0000	SURCHARGED
60 minute summer	SW12	42	2.786	0.362	7.2	0.0576	0.0000	SURCHARGED
60 minute summer	SW13	42	2.785	0.955	10.5	0.1519	0.0000	SURCHARGED
60 minute summer	SW14	41	2.778	1.203	43.0	0.3404	0.0000	FLOOD RISK
60 minute summer	RE15	40	2.769	0.269	13.4	3.6709	0.0000	SURCHARGED
60 minute summer	SW16	40	2.766	0.416	9.9	0.0662	0.0000	SURCHARGED
15 minute summer	RE17	12	3.105	0.605	4.4	0.0109	0.0000	FLOOD RISK
15 minute summer	SW18	12	3.101	0.717	7.3	0.1141	0.0000	FLOOD RISK
15 minute summer	RE19	12	3.130	0.630	5.3	0.0113	0.0000	FLOOD RISK
15 minute summer	SW20	12	3.120	0.730	12.7	0.1161	0.0000	FLOOD RISK
15 minute summer	SW21	12	3.059	0.905	27.3	0.1439	0.0000	FLOOD RISK
60 minute summer	DN16	40	2.765	0.756	21.0	0.1202	0.0000	SURCHARGED
2880 minute winter	SW22	2820	2.748	1.432	4.3	1.6192	0.0000	FLOOD RISK
2880 minute winter	SW23	2820	2.748	1.485	4.8	1.6792	0.0000	FLOOD RISK
2880 minute winter	RE24	2820	2.748	0.098	0.4	1.6320	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	RE01	1.000	SW02	-10.3	-0.587	-0.583	0.1181	
30 minute summer	SW02	1.001	SW05	-11.4	-0.647	-0.511	0.1428	
15 minute summer	RE03	2.000	SW04	-13.7	-0.909	-0.497	0.0739	
15 minute summer	SW04	2.001	SW05	-14.7	-0.832	-0.826	0.0776	
30 minute summer	SW05	1.002	SW06	-24.2	-1.377	-0.487	0.1438	
15 minute summer	SW06	1.003	SW14	29.2	1.658	1.453	0.3102	
60 minute summer	RE07	3.000	SW08	-8.5	0.751	-0.398	0.1599	
60 minute summer	SW08	3.001	SW14	7.5	1.338	0.142	0.1544	
60 minute summer	RE09	4.000	SW10	-3.2	0.399	-0.163	0.0722	
60 minute summer	SW10	4.001	SW13	5.9	0.931	0.124	0.1877	
60 minute summer	RE11	5.000	SW12	-6.5	0.934	-0.368	0.1338	
60 minute summer	SW12	5.001	SW13	-7.2	0.486	-0.085	0.0472	
60 minute summer	SW13	4.002	SW14	7.6	1.019	0.282	0.1387	
60 minute summer	SW14	1.004	SW22	39.8	1.090	1.000	1.2424	
60 minute summer	RE15	6.000	SW16	-9.3	1.047	-0.406	0.1606	
60 minute summer	SW16	6.001	DN16	-9.9	-0.564	-0.153	0.0459	
15 minute summer	RE17	7.000	SW18	4.6	0.408	0.260	0.2049	
15 minute summer	SW18	7.001	SW21	7.4	0.418	0.416	0.4079	
15 minute summer	RE19	8.000	SW20	4.3	0.292	0.244	0.1954	
15 minute summer	SW20	8.001	SW21	10.4	0.617	0.455	0.2507	
15 minute summer	SW21	7.002	DN16	26.6	1.508	1.494	0.2547	
60 minute summer	DN16	6.002	SW22	18.1	1.064	1.018	0.1180	
2880 minute winter	SW22	1.005	SW23	4.3	0.392	0.060	0.9098	
2880 minute winter	SW23	1.006	SW26	4.7	0.404	0.067	0.6310	
2880 minute winter	RE24	9.000	SW25	0.4	0.490	0.020	0.4373	

Results for 100 year +25% CC Critical Storm Duration. Lowest mass balance: 98.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute winter	SW25	2820	2.748	0.498	0.4	0.0791	0.0000	SURCHARGED
2880 minute winter	SW26	2820	2.748	1.522	5.5	1.7211	0.0000	FLOOD RISK
30 minute summer	RE27	25	2.752	0.152	21.5	3.4790	0.0000	SURCHARGED
2880 minute winter	SW28	2820	2.748	0.708	0.8	0.1125	0.0000	SURCHARGED
2880 minute winter	SW29	2820	2.748	0.348	2.5	82.5346	0.0000	SURCHARGED
2880 minute winter	SW30	2820	2.748	0.765	3.6	103.8473	0.0000	SURCHARGED
2880 minute winter	SW31	2760	2.748	0.848	2.6	0.2399	0.0000	SURCHARGED
2880 minute winter	DN31	2760	2.748	0.984	2.6	0.0000	0.0000	SURCHARGED
2880 minute winter	SW32	2820	2.748	0.598	5.2	159.9932	0.0000	FLOOD RISK
2880 minute winter	SW33	2820	2.748	1.015	6.7	123.2684	0.0000	FLOOD RISK
2880 minute winter	SW34	2820	2.748	1.098	6.2	0.3107	0.0000	FLOOD RISK
2880 minute winter	SW35	2820	2.748	1.822	6.6	2.6069	0.0000	FLOOD RISK
2880 minute winter	SW36	2820	2.748	0.698	3.9	123.1848	0.0000	FLOOD RISK
2880 minute winter	SW37	2760	2.748	1.041	6.0	123.2758	0.0000	FLOOD RISK
2880 minute winter	SW38	2820	2.748	1.124	5.3	0.3180	0.0000	FLOOD RISK
2880 minute winter	DN38	2820	2.748	1.835	5.5	0.0000	0.0000	FLOOD RISK
2880 minute winter	RE39	2820	2.748	0.348	0.8	16.8260	0.0000	SURCHARGED
2880 minute winter	SW40	2760	2.748	0.798	0.8	0.1268	0.0000	FLOOD RISK
2880 minute winter	SW41	2820	2.748	1.940	5.8	2.7757	0.0000	FLOOD RISK
2880 minute winter	RE42	2820	2.748	0.248	0.4	6.6606	0.0000	SURCHARGED
2880 minute winter	SW43	2760	2.748	0.470	0.4	0.0747	0.0000	SURCHARGED
15 minute summer	SW44	10	3.201	0.776	68.8	0.2197	0.0000	FLOOD RISK
2880 minute winter	DN44	2760	2.748	0.620	1.9	0.0000	0.0000	SURCHARGED
2880 minute winter	RE45	2820	2.748	0.398	0.4	8.4934	0.0000	SURCHARGED
2880 minute winter	SW46	2820	2.748	0.579	0.3	0.0920	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2880 minute winter	SW25	9.001	SW26	0.4	0.492	0.015	0.1218	
2880 minute winter	SW26	1.007	SW35	5.5	0.387	0.077	3.8632	
30 minute summer	RE27	10.000	SW28	18.2	1.127	1.029	0.9943	
2880 minute winter	SW28	10.001	DN31	0.8	0.441	0.043	0.3540	
2880 minute winter	SW29	11.000	SW30	-1.8	0.485	-0.103	0.6074	
2880 minute winter	SW30	11.001	SW31	-2.6	0.497	-0.065	0.5560	
2880 minute winter	SW31	11.002	DN31	-2.6	0.471	-0.032	0.2275	
2880 minute winter	DN31	10.002	SW35	-2.0	0.523	-0.039	0.6192	
2880 minute winter	SW32	12.000	SW33	-4.3	0.462	-0.241	0.6074	
2880 minute winter	SW33	12.001	SW34	-6.2	0.539	-0.156	0.5560	
2880 minute winter	SW34	12.002	SW35	-6.2	0.962	-0.032	0.1603	
2880 minute winter	SW35	1.008	DN38	3.9	0.342	0.035	0.4555	
2880 minute winter	SW36	13.000	SW37	-3.0	0.462	-0.172	0.4752	
2880 minute winter	SW37	13.001	SW38	-5.3	0.586	-0.132	0.5560	
2880 minute winter	SW38	13.002	DN38	-5.3	1.027	-0.027	0.1615	
2880 minute winter	DN38	1.009	SW41	-5.5	0.428	-0.049	1.0533	
2880 minute winter	RE39	14.000	SW40	0.8	0.442	0.043	0.7327	
2880 minute winter	SW40	14.001	SW41	0.8	0.436	0.044	0.1040	
2880 minute winter	SW41	1.010	DN47	5.7	0.339	0.036	2.4828	
2880 minute winter	RE42	15.000	SW43	0.4	0.412	0.023	0.3943	
2880 minute winter	SW43	15.001	DN44	0.4	0.412	0.023	0.1326	
15 minute summer	SW44	16.000	DN44	68.6	1.726	1.724	1.1056	
2880 minute winter	DN44	15.002	SW47	1.8	0.435	0.045	0.8268	
2880 minute winter	RE45	17.000	SW46	0.3	0.350	0.017	0.3206	
2880 minute winter	SW46	17.001	SW47	0.3	0.376	0.013	0.1100	

Results for 100 year +25% CC Critical Storm Duration. Lowest mass balance: 98.69%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute winter	SW47	2820	2.748	0.743	2.1	0.2102	0.0000	SURCHARGED
2880 minute winter	DN47	2820	2.748	1.979	6.8	2.8315	0.0000	SURCHARGED
2880 minute winter	SW48	2820	2.748	2.120	6.9	3.0332	0.0000	SURCHARGED
2880 minute winter	RE49	2760	2.748	0.598	0.4	3.7420	0.0000	FLOOD RISK
2880 minute winter	SW50	2820	2.748	0.665	0.8	0.1057	0.0000	FLOOD RISK
30 minute winter	SW51	22	2.815	0.990	33.2	0.2802	0.0000	SURCHARGED
60 minute summer	RE52	35	2.770	0.320	14.6	0.0058	0.0000	SURCHARGED
2880 minute winter	SW53	2820	2.748	1.085	1.7	0.3069	0.0000	SURCHARGED
2880 minute winter	SW54	2820	2.748	2.257	8.4	163.6540	0.0000	SURCHARGED
2880 minute winter	SW55	2820	2.748	2.333	2.7	4.1217	0.0000	SURCHARGED
2880 minute winter	SW56	2820	0.418	0.034	2.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2880 minute winter	SW47	15.003	DN47	2.0	0.477	0.050	0.1106	
2880 minute winter	DN47	1.011	SW48	6.7	0.376	0.042	8.9378	
2880 minute winter	SW48	1.012	SW54	6.8	0.409	0.043	3.9500	
2880 minute winter	RE49	18.000	SW50	0.3	0.274	0.017	0.1181	
2880 minute winter	SW50	18.001	SW54	0.8	0.485	0.044	0.2232	
30 minute winter	SW51	19.000	SW53	32.2	0.902	0.809	1.0885	
60 minute summer	RE52	20.000	SW53	15.6	1.396	0.456	0.3433	
2880 minute winter	SW53	19.001	SW54	1.7	0.398	0.042	0.5043	
2880 minute winter	SW54	1.013	SW55	2.7	0.150	0.012	2.7026	
2880 minute winter	SW55	1.014	SW56	2.0	0.632	0.110	0.0096	310.0

APPENDIX G

DRAINAGE MAINTENANCE PLAN



ARP ASSOCIATES
CHARTERED CONSULTING ENGINEERS

Our ref: 1506/54tn1a

4th July 2024

COMMERCIAL DEVELOPMENT PROJECTS LIMITED

DRAINAGE MAINTENANCE PLAN
FOR
COMMERCIAL DEVELOPMENT AT HOLBEACH ROAD, SPALDING

Introduction

It is essential that drainage systems, including any Sustainable Drainage Systems (SuDS) and proprietary components, are subject to periodic inspection and maintenance over their lifetime, so that they continue to function to the intended design standard.

This document sets out the responsibilities for management and maintenance of the proposed drainage systems at the above site, and outlines a recommended maintenance regime to be implemented by the responsible party.

This report has been initially prepared for the use and reliance of the Client only. The report shall not be relied upon or transferred to any other parties without the written agreement of ARP Associates. For the avoidance of any doubt, where ARP Associates enters into a letter of reliance for the benefit of a third party, that third party will be permitted to rely on the report. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party without ARP Associates consent.

Revision Status and Requirements for Future Review

This maintenance plan has been prepared for agreement with the Lead Local Flood Authority and Local Planning Authority. The document should be finalised upon completion of construction, including all listed drainage drawing references which should be revised to 'as-built' status.

This plan should be reviewed periodically to confirm it is meeting the objective of ensuring effective drainage is maintained. The maintenance plan should be revised as necessary to keep systems working effectively.

Drainage Drawings and Documentation

The following drawings illustrate the drainage systems for this development, and should be kept with the maintenance plan and referred to when considering maintenance requirements:

- 1506/54/05.01 Private Drainage Layout – Sheet 1 of 2
- 1506/54/05.02 Private Drainage Layout – Sheet 2 of 2
- [Drawing list to be confirmed at detailed design]

Any documentation relating to proprietary drainage components should be kept with the maintenance plan and referred to when considering maintenance requirements.

Any persons undertaking maintenance should ensure they refer to the most recent revision of the listed drawings and documentation for the drainage systems, including 'as-built' drawings when available.

Overview of Drainage Systems

The development is served by separate systems of foul and surface water drainage.

Surface water runoff from car parks is collected by permeable paving in the parking bays and roads are served by trapped gullies. Storage is provided in sub-base granular or cellular units below the permeable paved parking spaces. Surface water from roads, car park, and roofs is routed to a flow control device with a maximum rate of discharge of 2l/s. Additional storage is provided upstream of the flow control in tanks beneath hardstanding areas in the southeast of the site, to manage flow up to the '1 in 100 year' rainfall event, including an allowance for the projected impacts of climate change. The system discharges by gravity to a pumping station in the southeast of the site, before being pumped to a new outfall onto the Ordinary Watercourse system within the site.

Domestic foul wastewater is to be managed on-site using a package treatment plant. The treated effluent is to be discharged via the same pumped outfall as the surface water drainage (downstream of the surface water flow control device).

Maintenance Responsibility

The ongoing inspection and maintenance of the surface water drainage system on this development will remain the responsibility of the site owner, although the inspection and maintenance activities may be carried out by a suitable contractor or management company working on behalf of the owner. If work is subcontracted, the contractor should be provided with a copy of this plan and the relevant drawings and documentation.

In particular, it should be noted that the owner of the package treatment plant is legally responsible to ensure that the system does not cause pollution, a health hazard or a nuisance.

All operation, inspection and maintenance should be undertaken by suitably qualified and competent professionals, using safe systems of work. In particular, it should be recognised that some maintenance tasks may necessitate entry into confined spaces – these tasks should only be undertaken by suitably trained operatives, using an appropriate safe systems of work.

Attention is drawn to the requirements of the Construction Design and Management Regulations 2015, and in particular, the duties and obligations of the Client.

Maintenance Regime

As a minimum, it is recommended that inspection and maintenance follow the regime set out below. However, the timescales indicated below should be reviewed based on inspections and should be increased in frequency if required.

Notwithstanding any recommendations set out in this document, all proprietary components should be operated/inspected/maintained in accordance with the manufacturer's requirements/specifications.

Further advice on inspection and maintenance of SuDS components is set out in CIRIA publication C753 The SuDS Manual (2015).

Asset/Item	Inspection and Maintenance Requirement
Overall Maintenance inspections	Inspection at regular intervals with appropriate remedial works instigated should the inspection show a need. After heavy storms or sustained periods of inclement weather, on-site inspection should take place.
Linear (Channel and slot) Drainage	Linear Drainage should be cleaned at regular intervals, recommended not more than six months apart. Jet-washing and suction-borne methods are recommended, with the contents disposed of at a licenced waste facility.
Carrier Drains	Drains/sewers should be cleaned at regular intervals, recommended not more than six months apart. Jet-washing and suction-borne methods are recommended, with the contents disposed of at a licenced waste facility.
Manholes/Inspection Chambers	Visual inspection of manholes and inspection chambers, to check for any siltation or obstruction to flow, should be undertaken at regular intervals, recommended not more than six months apart.
Catch Pits	Catch pits should be cleaned at regular intervals, recommended not more than six months apart. Jet-washing and suction-borne methods are recommended, with the contents disposed of at a licenced waste facility. Catch pits should be inspected in advance of storm conditions if feasible, and should be re-inspected after heavy storms or sustained periods of inclement weather.
Guttering/Rainwater Downpipes	These should be cleaned at regular intervals, recommended not more than six months apart. In inclement months, this frequency is likely to increase.

Asset/Item	Inspection and Maintenance Requirement
Ironworks	Cover frames, gully lids etc. should be inspected at regular intervals, in particular to check line and level, and to ensure integrity, security of hinges and to check line/level is within safe and workable tolerance. Recommended not more than six months apart.
Car Park Roads and Kerb Channels	Manual or Motorised sweeping should be undertaken at appropriate intervals. Requirement should be periodically monitored and be flexible. Road level and low spots should be monitored to check for safe tolerance.
Attenuation Tank	Any attenuation tanks should be regularly inspected and maintained, as necessary, in accordance with Manufacturers requirements. The tank should be emptied of silt periodically (recommended not more than twelve months apart) using a suction unit and the contents disposed of at a licenced waste facility. Tanks should be inspected in advance of storm conditions if feasible, and should be re-inspected after heavy storms or sustained periods of inclement weather.
Vortex Flow Control	The flow control should be regularly inspected and maintained, as necessary, in accordance with Manufacturers requirements (recommended not more than twelve months apart). The sump of the unit should be emptied periodically (recommended not more than six months apart) using a suction unit and the contents disposed of at a licenced waste facility. The unit should be inspected in advance of storm conditions if feasible, and should be re-inspected after heavy storms or sustained periods of inclement weather.
Porous Paving	Annual brushing and stabilize permeable paving and contributing areas, removal of weeds and inspection of flows at outlets after rainfall events. Monitoring of silt accumulation in upstream silt traps and increase/co-ordinate surface's cleaning regime/silt trap emptying when needed.
Outfall/Inlet Headwalls and Flap Valves	Visual inspection of the surface water outfall and flap valve, to check for any obstruction to flow or debris, should be undertaken at regular intervals, recommended not more than six months apart. The outfall should be inspected in advance of storm conditions if feasible, and should be re-inspected after heavy storms or sustained periods of inclement weather.
Package Treatment Plant	The package treatment plant should be regularly inspected and maintained, as necessary, in accordance with Manufacturers recommendations. The unit should be fitted with a telemetry alarm system; should the alarm sound, the unit should be inspected, and maintenance implemented as appropriate. Any waste removed from the unit during maintenance must be removed by a registered waste carrier and disposed of appropriately.

Asset/Item	Inspection and Maintenance Requirement
Pumping Station	The pumping station should be regularly inspected and maintained, as necessary, in accordance with Manufacturer's requirements (recommended not more than twelve months apart). The unit should be fitted with a telemetry alarm system; should the alarm sound, the unit should be inspected, and maintenance implemented as appropriate. Any waste removed from the unit during maintenance must be removed by a registered waste carrier and disposed of appropriately.
Rising Main	The rising main should be regularly inspected and maintained, as necessary, in accordance with Manufacturers recommendations.
Grease Traps	This should be regularly inspected to check the build-up of debris, and should be emptied and cleaned at regular intervals, recommended not more than three months apart. Waste removed from the unit must be removed by a registered waste carrier and disposed of appropriately.
Watercourse Channels and Culverts	Visual inspection of watercourse culverts, to check for any obstruction to flow or erosion, should be undertaken at access manholes at regular intervals, recommended not more than six to twelve months apart. Culverts should be inspected in advance of storm conditions if feasible, and should be re-inspected after heavy storms or sustained periods of inclement weather.

Package Treatment Plant / Environmental Permit

The discharge of treated foul effluent from the package treatment plant to the watercourse to the south-east of the site, is subject to an Environmental Permit from the Environment Agency. The discharge must not cause pollution of surface water or groundwater, and the quality of the water discharged must comply with the terms of the permit at all times.

Any future changes to the foul discharge profile should be discussed with the Environment Agency to determine if a variation to the Environmental Permit is required.

The validity of the Environmental Permit is subject to this maintenance plan being implemented, particularly with respect to the package treatment plant being maintained in accordance with the manufacturer's instructions, such that the treated effluent quality remains as per the original design.

Details of the Environmental Permit holder must be kept up to date with the Environment Agency. An annual 'subsistence charge' for the permit may be payable to the Environment Agency by the permit holder.

If the site is sold, the operator must give the new operator a written notice stating that a small sewage discharge is being carried out and giving a description of the wastewater system and its maintenance requirements. The operator must ensure the system is appropriately decommissioned where it ceases to be in operation so that there is no risk of pollutants or polluting matter entering groundwater or watercourses.

Watercourses

There is an unnamed ditch/watercourse on the south-eastern boundary of the site, into which surface water runoff and treated foul effluent are discharged. This is classified as an 'Ordinary Watercourse'.

Responsibility for maintaining any watercourse rests with the owner of the watercourse; Under the principle of riparian ownership, the owner of any reach of the watercourse is normally the party who own the land through which the watercourse flows. Where the watercourse lies on a land ownership boundary, the two landowners normally have responsibility to the centre line of the watercourse. Further guidance on watercourse ownership responsibilities is available from <https://www.gov.uk/guidance/owning-a-watercourse>.

Visual inspection of the watercourse should be undertaken at regular intervals to check for any obstruction to flow or erosion. It is recommended that inspections take place not more than six months apart, but also after heavy storms or sustained periods of inclement weather. If advance warning is given, inspection should also take place prior to expected heavy storms or sustained periods of inclement weather.

Rubbish and debris which could cause an obstruction should be removed as necessary if safe to do so. General maintenance of the watercourse corridor should take place as required to maintain the flow, but you should check whether any work proposed requires prior consent. Works must not result in detriment to water quality, flood risk or ecology.

A Land Drainage Consent (under the Land Drainage Act 1991) may be required from the Land Drainage Authority (the local Internal Drainage Board) for any works (temporary or permanent) which have the potential to obstruct the flow in the watercourse, restrict flood storage, create a culvert, or modify any 'obstruction' already in place. Advice should be sought from the Land Drainage Authority in advance if any works affecting the watercourse are proposed.

Note: Land Drainage Authorities have permissive powers to maintain and improve Ordinary Watercourses in their area. Permissive powers include the power to force landowners to carry out maintenance if the watercourse is causing flooding etc elsewhere; or the power to undertake such maintenance and re-charge the landowner.