Appendix D Existing Drainage Calculations

MicroDrainage schedule and results for existing network

Stantec Drawing 47179/4001/001 Existing Impermeable Areas

FEH Greenfield Runoff

FEH Greenfield Runoff

Per Hectare

Using 2008 QMED Equation

Project Title	Comet Way, Hatfield
Project No	47179

Methodology as set out in SuDS Manual 24.3.2 — SUDS Manual Chapter 24

1 Retrieve FEH Catchment Information

Export catchment data from FEH CDROM as .csv file and save in FEH data export

Catchment Descriptors	**BFIHOST**	0.532		*see note 1*
	SAAR	657.0		*see note 1*
	FARL	1.0		*see note 2*

2 Derive QBAR (mean annual flood)

Define area	**Site Area**	0.47	ha	
	Applied Area	50.0	ha	*see note 3*
FEH Index Flood (SuDS Manual Equation 24.2)	**QMED (Q_2)**	1.0	l/s	*see note 4*
Calculate QBAR by dividing QMED by 2yr growth factor	**QBAR**	1.2	l/s	*see note 5*

3 Select appropriate growth factors

FSR Hydrological Region		6	*(refer to FSR Hydrological Region tab)*
100yr Growth Curve Factor	GQ_{100}	3.19	
30yr Growth Curve Factor	GQ_{30}	2.40	
10yr Growth Curve Factor	GQ_{10}	1.62	
2yr Growth Curve Factor	GQ_2	0.88	
1yr Growth Curve Factor	GQ_1	0.85	

4 Derive Flood Frequency

Greenfield Runoff per 1ha

100yr Peak Runoff Rate	Q_{100}	3.8	l/s	Q_{100}	8.1	l/s/ha
30yr Peak Runoff Rate	Q_{30}	2.9	l/s	Q_{30}	6.1	l/s/ha
10yr Growth Curve Factor	Q_{10}	1.9	l/s	Q_{10}	4.1	l/s/ha
QBAR Peak Runoff Rate	QBAR	1.2	l/s	Q_{BAR}	2.5	l/s/ha
2yr Peak Runoff Rate	Q_2	1.0	l/s	Q_2	2.2	l/s/ha
1yr Peak Runoff Rate	Q_1	1.0	l/s	Q_1	2.1	l/s/ha

Location of FEH Data (as Hyperlink) — J:\47179 Comet Way Hatfield\Calculations\Catchme

DOCUMENT ISSUE RECORD

Rev	Comments	Prepared	Date	Checked	Date
		MD	26.02.20	HA	06.02.20

Sheet created by Alex Bearne

Last updated 03.01.18 Recommended Review 01.07.18

Notes This spreadsheet has been created to allow derivation of greenfield runoff rates using the FEH statistical method applied in a manner consistent with the recommendations of the SuDS Manual. If you have recommendations to improve this spreadsheet please contact the owner.

Note 1 FEH Web version 3 allows extraction of BFIHOST and SAAR values for each square kilometre grid If you do not think the BFIHOST value is representative of your site then it is possible to derive it manually. This should only very occasionally be necessary. BFI can be derived manually using the the methodology set out in the Flood Estimation Handbook (see *Manual Derivation of BFIHOST tab).*

Note 2 FARL value is a measure of attenuation from reservoirs and lakes for the majority of studies this should be set to 1 (representing no attenuation). If your site includes a large water body with an attenuating affect on runoff please consult a hydrologist.
FARL is a measurement of studies water bodies in the catchment so that their attenuation effects so this term becomes 1.0 and therefore drops out. (see page 23 of the Preliminary rainfall runoff management for developments EA/Defra 2013)
Rainfall runoff management for developments.pdf

Note 3 If the site area is less than 50 hectare the spreadsheet will calculate QMED for 50ha and scale the results automatically to the defined Site Area

Note 4 QMED is calculated using the statistical equation as revised by Kjeldsen in 2008

$$Q_{MED} = 8.3062AREA^{0.8510} .0.1536^{(1000/SAAR)} .FARL^{3.4451} .0.0460^{BFIHOST\wedge 2}$$

Rainfall runoff management for developments.pdf
It is reproduced as Equation 24.2 in the SUDS Manual (pg 512)

Note 5 QBAR is calculated by dividing QMED by the growth factor for the 2 year event, as per the methodology set out in paragraph 6.2.2 of 'Rainfall runoff management for developments' . QBAR is then used as the index flood for the basis of applying the growth factors.

Checked by Natasha Vaughan, Clare Waller, David Collis

PIPELINE SCHEDULES for Existing

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	150	MH7	76.150	75.890	0.110	Open Manhole	1200
1.001	o	225	MH8	76.150	75.065	0.860	Open Manhole	1200
1.002	o	225	MH11	76.250	75.015	1.010	Open Manhole	1200
2.000	o	100	MH25	76.160	75.340	0.720	Open Manhole	1200
2.001	o	150	MH20	76.100	75.090	0.860	Open Manhole	1200
2.002	o	150	MH17	76.010	74.940	0.920	Open Manhole	1200
1.003	o	150	MH15	76.080	74.770	1.160	Open Manhole	1200
1.004	o	300	671F	75.980	74.210	1.470	Open Manhole	1200
1.005	o	300	671D	76.130	73.880	1.950	Open Manhole	1200
1.006	o	300	671E	74.380	72.860	1.220	Open Manhole	1200
3.000	o	100	MH3	76.120	74.920	1.100	Open Manhole	1200
3.001	o	150	MH6	76.030	74.520	1.360	Open Manhole	1200
3.002	o	150	MH1	76.240	74.090	2.000	Open Manhole	1200
1.007	o	300	671B	75.830	72.650	2.880	Open Manhole	1200
1.008	o	375	571C	76.100	71.995	3.730	Open Manhole	1350
4.000	o	150	MH26	76.160	75.550	0.460	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)
1.000	14.382	19.2	MH8	76.150	75.140	0.860	Open Manhole	1200
1.001	8.179	163.6	MH11	76.250	75.015	1.010	Open Manhole	1200
1.002	16.480	51.5	MH15	76.080	74.695	1.160	Open Manhole	1200
2.000	15.163	75.8	MH20	76.100	75.140	0.860	Open Manhole	1200
2.001	14.384	95.9	MH17	76.010	74.940	0.920	Open Manhole	1200
2.002	12.945	76.1	MH15	76.080	74.770	1.160	Open Manhole	1200
1.003	13.900	33.9	671F	75.980	74.360	1.470	Open Manhole	1200
1.004	5.812	17.6	671D	76.130	73.880	1.950	Open Manhole	1200
1.005	21.002	20.6	671E	74.380	72.860	1.220	Open Manhole	1200
1.006	29.409	140.0	671B	75.830	72.650	2.880	Open Manhole	1200
3.000	6.938	19.8	MH6	76.030	74.570	1.360	Open Manhole	1200
3.001	20.806	48.4	MH1	76.240	74.090	2.000	Open Manhole	1200
3.002	3.660	2.8	671B	75.830	72.800	2.880	Open Manhole	1200
1.007	16.921	29.2	571C	76.100	72.070	3.730	Open Manhole	1350
1.008	4.739	49.9	571A	75.990	71.900	3.715	Open Manhole	0
4.000	13.181	36.6	MH24	76.060	75.190	0.720	Open Manhole	1200

PIPELINE SCHEDULES for Existing

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)
4.001	o	150	MH24	76.060	75.190	0.720	Open Manhole	1200
4.002	o	150	MH27	76.020	75.090	0.780	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)
4.001	4.549	91.0	MH27	76.020	75.140	0.730	Open Manhole	1200
4.002	2.076	41.5		76.000	75.040	0.810	Open Manhole	0

Area Summary for Existing

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.013	0.013	0.013
	User	-	100	0.066	0.066	0.078
1.001	-	-	100	0.000	0.000	0.000
1.002	User	-	100	0.032	0.032	0.032
2.000	-	-	100	0.000	0.000	0.000
2.001	User	-	100	0.021	0.021	0.021
2.002	User	-	100	0.059	0.059	0.059
1.003	User	-	100	0.014	0.014	0.014
1.004	User	-	100	0.033	0.033	0.033
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.047	0.047	0.047
3.001	User	-	100	0.085	0.085	0.085
	User	-	100	0.005	0.005	0.089
3.002	User	-	100	0.031	0.031	0.031
	User	-	100	0.000	0.000	0.031
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.053	0.053	0.053
4.001	-	-	100	0.000	0.000	0.000
4.002	User	-	100	0.004	0.004	0.004
	User	-	100	0.014	0.014	0.017
				Total	Total	Total
				0.474	0.474	0.474

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Existing

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	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 0.440
Region	England and Wales	Cv (Summer)	0.900
M5-60 (mm)	20.000	Cv (Winter)	0.900

Margin for Flood Risk Warning (mm)	0.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60
Return Period(s) (years)	1
Climate Change (%)	0

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
1.000	MH7	15	76.150	75.951	-0.089	0.000	12.7	OK
1.001	MH8	15	76.150	75.165	-0.125	0.000	12.8	OK
1.002	MH11	15	76.250	75.094	-0.146	0.000	17.1	OK
2.000	MH25	15	76.160	75.340	-0.100	0.000	0.0	OK
2.001	MH20	15	76.100	75.132	-0.108	0.000	2.9	OK
2.002	MH17	15	76.010	75.024	-0.066	0.000	11.0	OK
1.003	MH15	15	76.080	74.932	0.012	0.000	28.7	SURCHARGED
1.004	671F	15	75.980	74.307	-0.203	0.000	32.7	OK
1.005	671D	15	76.130	73.958	-0.222	0.000	32.7	OK
1.006	671E	15	74.380	72.989	-0.171	0.000	32.7	OK
3.000	MH3	15	76.120	74.977	-0.043	0.000	7.6	OK
3.001	MH6	15	76.030	74.626	-0.044	0.000	20.0	OK
3.002	MH1	15	76.240	74.151	-0.089	0.000	24.2	OK
1.007	671B	15	75.830	72.767	-0.183	0.000	56.4	OK
1.008	571C	15	76.100	72.175	-0.195	0.000	56.1	OK
4.000	MH26	15	76.160	75.609	-0.091	0.000	8.7	OK
4.001	MH24	15	76.060	75.276	-0.064	0.000	8.7	OK
4.002	MH27	15	76.020	75.192	-0.048	0.000	11.1	OK

2 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Existing

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 521649 208769 TL 21649 08769
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

Margin for Flood Risk Warning (mm)	0.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60
Return Period(s) (years)	2
Climate Change (%)	0

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
1.000	MH7	15	76.150	75.955	-0.085	0.000	14.3	OK
1.001	MH8	15	76.150	75.172	-0.118	0.000	14.4	OK
1.002	MH11	15	76.250	75.099	-0.141	0.000	19.2	OK
2.000	MH25	15	76.160	75.340	-0.100	0.000	0.0	OK
2.001	MH20	15	76.100	75.135	-0.105	0.000	3.2	OK
2.002	MH17	15	76.010	75.052	-0.038	0.000	12.3	OK
1.003	MH15	15	76.080	74.996	0.076	0.000	30.8	SURCHARGED
1.004	671F	15	75.980	74.311	-0.199	0.000	35.1	OK
1.005	671D	15	76.130	73.961	-0.219	0.000	35.2	OK
1.006	671E	15	74.380	72.994	-0.166	0.000	35.2	OK
3.000	MH3	15	76.120	74.982	-0.038	0.000	8.6	OK
3.001	MH6	15	76.030	74.635	-0.035	0.000	22.4	OK
3.002	MH1	15	76.240	74.155	-0.085	0.000	27.1	OK
1.007	671B	15	75.830	72.772	-0.178	0.000	61.0	OK
1.008	571C	15	76.100	72.184	-0.186	0.000	60.7	OK
4.000	MH26	15	76.160	75.613	-0.087	0.000	9.7	OK
4.001	MH24	15	76.060	75.283	-0.057	0.000	9.7	OK
4.002	MH27	15	76.020	75.200	-0.040	0.000	12.4	OK

30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Existing

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 521649 208769 TL 21649 08769
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

Margin for Flood Risk Warning (mm)	0.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60
Return Period(s) (years)	30
Climate Change (%)	0

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
1.000	MH7	15	76.150	76.150	0.110	0.189	28.9	FLOOD
1.001	MH8	15	76.150	75.909	0.619	0.000	24.3	SURCHARGED
1.002	MH11	15	76.250	75.888	0.648	0.000	29.5	SURCHARGED
2.000	MH25	15	76.160	75.988	0.548	0.000	2.9	SURCHARGED
2.001	MH20	15	76.100	75.950	0.710	0.000	9.0	SURCHARGED
2.002	MH17	15	76.010	75.998	0.908	0.000	18.2	SURCHARGED
1.003	MH15	15	76.080	75.825	0.905	0.000	50.3	SURCHARGED
1.004	671F	15	75.980	74.350	-0.160	0.000	62.3	OK
1.005	671D	15	76.130	73.991	-0.189	0.000	62.2	OK
1.006	671E	15	74.380	73.052	-0.108	0.000	61.4	OK
3.000	MH3	15	76.120	76.093	1.073	0.000	16.5	SURCHARGED
3.001	MH6	15	76.030	75.675	1.005	0.000	43.3	SURCHARGED
3.002	MH1	15	76.240	74.193	-0.047	0.000	55.7	OK
1.007	671B	15	75.830	72.830	-0.120	0.000	116.4	OK
1.008	571C	15	76.100	72.289	-0.081	0.000	116.4	OK
4.000	MH26	15	76.160	75.713	0.013	0.000	20.9	SURCHARGED
4.001	MH24	15	76.060	75.490	0.150	0.000	21.5	SURCHARGED
4.002	MH27	15	76.020	75.381	0.141	0.000	27.6	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Existing

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 521649 208769 TL 21649 08769
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

Margin for Flood Risk Warning (mm)	0.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
1.000	MH7	30	76.150	76.153	0.113	2.960	28.4	FLOOD
1.001	MH8	15	76.150	76.044	0.754	0.000	25.7	SURCHARGED
1.002	MH11	15	76.250	76.027	0.787	0.000	32.4	SURCHARGED
2.000	MH25	15	76.160	76.048	0.608	0.000	3.2	SURCHARGED
2.001	MH20	15	76.100	76.054	0.814	0.000	9.3	SURCHARGED
2.002	MH17	15	76.010	76.013	0.923	3.269	22.1	FLOOD
1.003	MH15	15	76.080	75.943	1.023	0.000	52.5	SURCHARGED
1.004	671F	15	75.980	74.362	-0.148	0.000	70.4	OK
1.005	671D	15	76.130	74.000	-0.180	0.000	70.7	OK
1.006	671E	15	74.380	73.072	-0.088	0.000	70.8	OK
3.000	MH3	15	76.120	76.123	1.103	2.657	21.4	FLOOD
3.001	MH6	15	76.030	76.030	1.360	0.467	49.3	FLOOD
3.002	MH1	15	76.240	74.207	-0.033	0.000	65.8	OK
1.007	671B	15	75.830	72.850	-0.100	0.000	136.8	OK
1.008	571C	15	76.100	72.379	0.009	0.000	136.3	SURCHARGED
4.000	MH26	15	76.160	75.945	0.245	0.000	25.3	SURCHARGED
4.001	MH24	15	76.060	75.619	0.279	0.000	25.7	SURCHARGED
4.002	MH27	15	76.020	75.461	0.221	0.000	32.3	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Existing

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 521649 208769 TL 21649 08769
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

Margin for Flood Risk Warning (mm)	0.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Pipe Flow (l/s)	Status
1.000	MH7	15	76.150	76.161	0.121	10.827	29.3	FLOOD
1.001	MH8	15	76.150	76.124	0.834	0.000	25.2	SURCHARGED
1.002	MH11	15	76.250	76.114	0.874	0.000	37.1	SURCHARGED
2.000	MH25	30	76.160	76.080	0.640	0.000	3.9	SURCHARGED
2.001	MH20	30	76.100	76.100	0.860	0.109	12.5	FLOOD
2.002	MH17	15	76.010	76.020	0.930	10.277	23.6	FLOOD
1.003	MH15	15	76.080	76.003	1.083	0.000	53.6	SURCHARGED
1.004	671F	15	75.980	74.373	-0.137	0.000	82.6	OK
1.005	671D	15	76.130	74.009	-0.171	0.000	82.3	OK
1.006	671E	15	74.380	73.095	-0.065	0.000	81.2	OK
3.000	MH3	15	76.120	76.127	1.107	7.125	24.7	FLOOD
3.001	MH6	15	76.030	76.035	1.365	5.084	49.4	FLOOD
3.002	MH1	15	76.240	74.346	0.106	0.000	73.5	SURCHARGED
1.007	671B	15	75.830	72.870	-0.080	0.000	155.6	OK
1.008	571C	15	76.100	72.414	0.044	0.000	155.6	SURCHARGED
4.000	MH26	15	76.160	76.161	0.461	1.447	30.1	FLOOD
4.001	MH24	15	76.060	75.791	0.451	0.000	30.2	SURCHARGED
4.002	MH27	15	76.020	75.604	0.364	0.000	40.2	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Existing

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	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	0.440
Region	England and Wales	Cv (Summer)	0.900
M5-60 (mm)	20.000	Cv (Winter)	0.900

Margin for Flood Risk Warning (mm)	0.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Duration (mins)	US/CL (m)	Discharge Vol (m³)	Status
1.000	MH7	360	76.150	42.501	OK
1.001	MH8	360	76.150	42.561	OK
1.002	MH11	360	76.250	59.784	OK
2.000	MH25	360	76.160	0.000	OK
2.001	MH20	360	76.100	11.210	OK
2.002	MH17	360	76.010	43.171	OK
1.003	MH15	360	76.080	110.522	OK
1.004	671F	360	75.980	128.794	OK
1.005	671D	360	76.130	129.000	OK
1.006	671E	360	74.380	129.111	OK
3.000	MH3	360	76.120	25.282	OK
3.001	MH6	360	76.030	73.772	OK
3.002	MH1	360	76.240	90.772	OK
1.007	671B	360	75.830	220.197	OK
1.008	571C	360	76.100	220.428	OK
4.000	MH26	360	76.160	28.701	OK
4.001	MH24	360	76.060	28.752	OK
4.002	MH27	360	76.020	38.147	OK

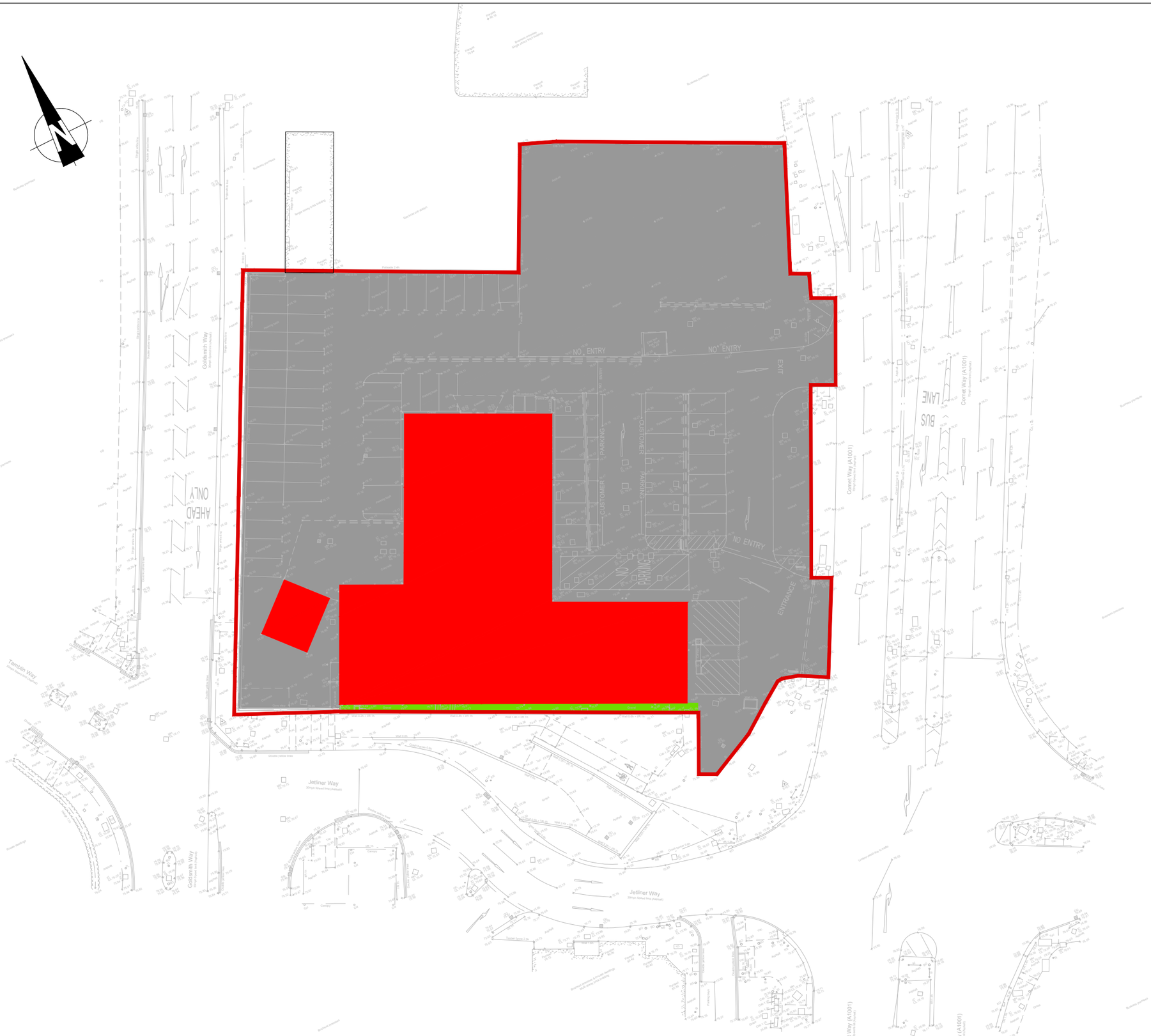
Appendix E Proposed Drainage Information

Stantec Drawing 47179/4001/002 Surface Water Drainage Strategy

Stantec Drawing 47179/4001/003 Foul Drainage Strategy

MicroDrainage surface water network schedule and results

Thames Water pre-development enquiry response dated 12th November 2020



EXISTING PERMEABLE/IMPERMEABLE AREAS		
		AREA (m²)
	IMPERMEABLE ROOF AREA	1095
	IMPERMEABLE HARDSTANDING AREA	3571
	PERMEABLE AREA	48

Total Impermeable Area = 4666m²
Total Site Area = 4714m²

NOTES:

1. TOPOGRAPHIC SURVEY HAS BEEN PROVIDED BY SURVEY SOLUTIONS DRAWING REF 25372se-01 DATED 06.11.19.

Mark	Revision	Date	Drawn	Chkd	Appd

SCALING NOTE: Do not scale this drawing - any errors or omissions shall be reported to Stantec without delay.

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Drawing Issue Status

FOR INFORMATION

COMET WAY, HATFIELD

EXISTING IMPERMEABLE AREA

Client

COMET WAY
HATFIELD LTD

Date of 1st Issue	Designed	Drawn
22.10.20	-	JS
A3 Scale	Checked	Approved
1:500	EE	-

Drawing Number: 47179/4001/001

Revision: -

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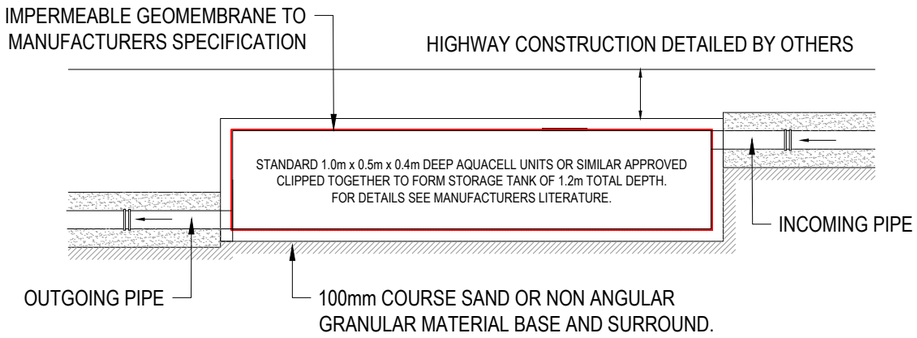
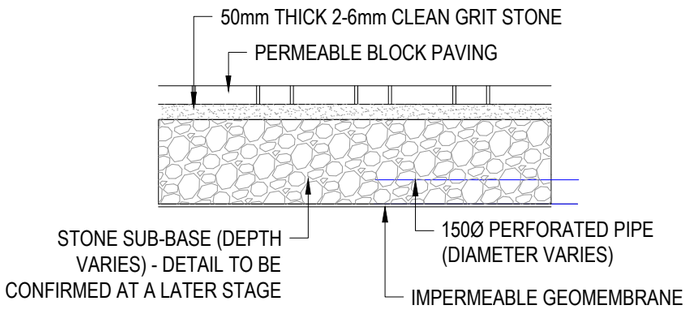
Tel: 01189 500 761



CELLULAR STORAGE DETAIL

NTS



LINED PERMEABLE PAVING DETAIL

NTS

NOTES

1. THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND SHOULD NOT BE USED FOR CONSTRUCTION.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN UNLESS NOTED OTHERWISE.
4. ALL COORDINATES ARE IN METRES RELATIVE TO ORDNANCE SURVEY NATIONAL GRID.
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS AND ARCHITECTS DRAWINGS AND SPECIFICATIONS.
6. CONNECTION AND LOCATION OF MANHOLE TO PUBLIC SEWER SUBJECT TO AGREEMENT WITH THAMES WATER UTILITIES LTD.
7. MODEL NODES ARE FROM MICRODRAINAGE FOR THE INCLUSION OF ATTENUATION FEATURES WITHIN THE DRAINAGE MODEL AND WILL NOT BE CONSTRUCTED.

KEY:

- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED SURFACE WATER MANHOLE/CATCHPIT
- PROPOSED PERMEABLE PAVING
- IMPERMEABLE SURFACE
- PROPOSED DEVELOPMENT
- PROPOSED GREEN ROOF
- PROPOSED ROOF PLANTERS
- PROPOSED CELLULAR STORAGE
- EXISTING SURFACE WATER MANHOLE
- EXISTING SURFACE WATER DRAINAGE
- PROPOSED PERFORATED PIPE
- PROPOSED MODEL NODE - SEE NOTE 7
- PROPOSED LANDSCAPE AREAS
- PROPOSED DOWNPIPE CONNECTION
- PROPOSED DEMARCATION CHAMBER
- PROPOSED RAINWATER DIFFUSER UNIT
- EXCEEDANCE FLOW ROUTE
- SITE BOUNDARY
- PROPOSED FOOTPATHS
- PROPOSED DUMMY PIPES - SEE NOTE 7

CONSTRUCTION (DESIGN & MANAGEMENT) REGULATIONS 2015 (CDM REGULATIONS 2015)

THE PROPOSED SURFACE WATER DRAINAGE ARRANGEMENTS ARE BASED ON THE FOLLOWING INFORMATION AVAILABLE AT THE TIME:

- TOPOGRAPHIC SURVEY HAS BEEN PROVIDED BY SURVEY SOLUTIONS DRAWING REF 25372se-01 DATED 06.11.19.
- PROPOSAL DRAWING PROVIDED BY BRYANT & MOORE ARCHITECTS REF. 19_386_PL07 DATED NOVEMBER 2020

AT THIS STAGE OF DESIGN IT HAS NOT BEEN POSSIBLE TO ELIMINATE ALL THE HEALTH AND SAFETY RISKS AND RESIDUAL RISKS TO THE PROPOSED GROUND WORKS, FOR EXAMPLE, IN RELATION TO THE LOCATION OF UNDERGROUND UTILITIES & GROUND CONDITIONS. SUCH RESIDUAL RISKS NEED TO BE MITIGATED AGAINST BY THE CLIENT AND COMMUNICATED TO FUTURE DESIGN TEAMS SO THAT AN ATTEMPT CAN BE MADE TO DESIGN THEM OUT AS THE DETAILED DESIGN IS PROGRESSED AND SITE CONSTRAINTS ARE FULLY UNDERSTOOD. ANY RISKS THAT ARE NOT DESIGNED OUT DURING THE DETAILED DESIGN STAGE MUST BE COMMUNICATED FURTHER TO THE CONSTRUCTION TEAM AND END USER SO THAT ADEQUATE MITIGATION MEASURES CAN BE PLANNED FOR AND MANAGED.

SCALING NOTE: Do not scale this drawing - any errors or omissions shall be reported to Stantec without delay.

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Drawing Issue Status

FOR PLANNING

COMET WAY, HATFIELD

SURFACE WATER DRAINAGE STRATEGY

Client

COMET WAY HATFIELD LTD

Date of 1st Issue	Designed	Drawn
12.11.2020	EE	JS
A3 Scale	**Checked**	**Approved**
1:500	EE	-

Drawing Number	Revision
47179/4001/002	-

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Tel: 01189 500 761

KEY:

- PROPOSED FOUL WATER DRAINAGE
- PROPOSED FOUL WATER MANHOLE
- PROPOSED BUILDING FOOTPRINT
- SITE BOUNDARY
- EXISTING FOUL WATER DRAINAGE
- EXISTING FOUL WATER MANHOLE

NOTES

1. THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND SHOULD NOT BE USED FOR CONSTRUCTION.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN UNLESS NOTED OTHERWISE.
4. ALL COORDINATES ARE IN METRES RELATIVE TO ORDNANCE SURVEY NATIONAL GRID.
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS AND ARCHITECTS DRAWINGS AND SPECIFICATIONS.
6. CONNECTION AND LOCATION OF MANHOLE TO PUBLIC SEWER SUBJECT TO AGREEMENT WITH THAMES WATER UTILITIES LTD.

CONSTRUCTION (DESIGN & MANAGEMENT) REGULATIONS 2015 (CDM REGULATIONS 2015)

THE PROPOSED FOUL WATER DRAINAGE ARRANGEMENTS ARE BASED ON THE FOLLOWING INFORMATION AVAILABLE AT THE TIME:

- TOPOGRAPHIC SURVEY HAS BEEN PROVIDED BY SURVEY SOLUTIONS DRAWING REF 25372se-01 DATED 06.11.19.
- PROPOSAL DRAWING PROVIDED BY BRYANT & MOORE ARCHITECTS REF. 19_386_PL07 DATED NOVEMBER 2020

AT THIS STAGE OF DESIGN IT HAS NOT BEEN POSSIBLE TO ELIMINATE ALL THE HEALTH AND SAFETY RISKS AND RESIDUAL RISKS TO THE PROPOSED GROUND WORKS, FOR EXAMPLE, IN RELATION TO THE LOCATION OF UNDERGROUND UTILITIES & GROUND CONDITIONS. SUCH RESIDUAL RISKS NEED TO BE MITIGATED AGAINST BY THE CLIENT AND COMMUNICATED TO FUTURE DESIGN TEAMS SO THAT AN ATTEMPT CAN BE MADE TO DESIGN THEM OUT AS THE DETAILED DESIGN IS PROGRESSED AND SITE CONSTRAINTS ARE FULLY UNDERSTOOD. ANY RISKS THAT ARE NOT DESIGNED OUT DURING THE DETAILED DESIGN STAGE MUST BE COMMUNICATED FURTHER TO THE CONSTRUCTION TEAM AND END USER SO THAT ADEQUATE MITIGATION MEASURES CAN BE PLANNED FOR AND MANAGED.

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Drawing Issue Status

FOR PLANNING

COMET WAY, HATFIELD

FOUL WATER DRAINAGE STRATEGY

Client

COMET WAY HATFIELD LTD

Date of 1st Issue	Designed	Drawn
12.11.2020	EE	JS
A3 Scale	Checked	Approved
1:500	EE	-

Drawing Number	Revision
47179/4001/003	-

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Tel: 01189 500 761

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	68.238	0.045	1516.4	0.000	5.00	0.0	0.600	o	1350	Pipe/Conduit	
2.000	9.957	0.100	99.6	0.098	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	8.995	0.030	299.8	0.031	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	12.146	0.160	75.9	0.068	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.002	8.525	0.030	284.2	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	12.834	0.150	85.6	0.056	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.003	21.342	0.080	266.8	0.043	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.004	11.761	0.030	392.0	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.005	1.712	0.060	28.5	0.021	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.006	22.232	0.050	444.6	0.003	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.007	14.844	0.185	80.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	59.49	6.11	72.110	0.000	0.0	0.0	0.0	1.02	1465.1	0.0
2.000	64.50	5.16	75.910	0.098	0.0	0.0	0.0	1.01	17.8«	20.5
2.001	63.02	5.43	75.810	0.129	0.0	0.0	0.0	0.58	10.2«	26.3
3.000	64.44	5.18	75.940	0.068	0.0	0.0	0.0	1.16	20.4	14.3
2.002	62.02	5.61	75.705	0.225	0.0	0.0	0.0	0.77	30.6«	45.3
4.000	64.31	5.20	75.900	0.056	0.0	0.0	0.0	1.09	19.2	11.7
2.003	59.75	6.06	75.675	0.324	0.0	0.0	0.0	0.80	31.6«	62.9
2.004	58.34	6.36	75.595	0.349	0.0	0.0	0.0	0.65	26.0«	66.2
2.005	58.27	6.37	74.920	0.370	0.0	0.0	0.0	1.89	33.4«	70.0
2.006	55.64	6.98	73.460	0.373	0.0	0.0	0.0	0.61	24.4«	70.0
2.007	54.75	7.20	73.410	0.373	0.0	0.0	0.0	1.12	19.8«	70.0

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.001	22.226	0.070	317.5	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
1.002	4.739	0.095	49.9	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.001	54.11	7.36	72.025	0.373	0.0	0.0	0.0	2.25	3222.8	70.0
1.002	54.05	7.37	71.995	0.373	0.0	0.0	0.0	5.70	8159.0	70.0

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	1350	681A	75.510	72.110	2.050	Open Manhole	2250
2.000	o	150	RWDP1	76.500	75.910	0.440	Open Manhole	1200
2.001	o	150	PP1	76.400	75.810	0.440	Open Manhole	1200
3.000	o	150	RWDP2	76.500	75.940	0.410	Open Manhole	1200
2.002	o	225	PP2	76.350	75.705	0.420	Open Manhole	1200
4.000	o	150	RWDP3	76.500	75.900	0.450	Open Manhole	1200
2.003	o	225	PP3	76.320	75.675	0.420	Open Manhole	1200
2.004	o	225	PP4	76.240	75.595	0.420	Open Manhole	1200
2.005	o	150	PP5	76.220	74.920	1.150	Open Manhole	1200
2.006	o	225	CPIT	76.200	73.460	2.515	Open Manhole	1200
2.007	o	150	FLOW CONTROL	76.200	73.410	2.640	Open Manhole	1200
1.001	o	1350	SITE CONNECTION	75.970	72.025	2.595	Open Manhole	2250

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	68.238	1516.4	SITE CONNECTION	75.970	72.065	2.555	Open Manhole	2250
2.000	9.957	99.6	PP1	76.400	75.810	0.440	Open Manhole	1200
2.001	8.995	299.8	PP2	76.350	75.780	0.420	Open Manhole	1200
3.000	12.146	75.9	PP2	76.350	75.780	0.420	Open Manhole	1200
2.002	8.525	284.2	PP3	76.320	75.675	0.420	Open Manhole	1200
4.000	12.834	85.6	PP3	76.320	75.750	0.420	Open Manhole	1200
2.003	21.342	266.8	PP4	76.240	75.595	0.420	Open Manhole	1200
2.004	11.761	392.0	PP5	76.220	75.565	0.430	Open Manhole	1200
2.005	1.712	28.5	CPIT	76.200	74.860	1.190	Open Manhole	1200
2.006	22.232	444.6	FLOW CONTROL	76.200	73.410	2.565	Open Manhole	1200
2.007	14.844	80.2	SITE CONNECTION	75.970	73.225	2.595	Open Manhole	2250
1.001	22.226	317.5	571C	76.100	71.955	2.795	Open Manhole	2250

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)
1.002	o	1350	571C	76.100	71.995	2.755	Open Manhole	2250

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)
1.002	4.739	49.9	571A	75.990	71.900	2.740	Open Manhole	0

Online Controls for Storm

Orifice Manhole: PP5, DS/PN: 2.005, Volume (m³): 1.9

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 74.920

Hydro-Brake® Optimum Manhole: FLOW CONTROL, DS/PN: 2.007, Volume (m³): 4.0

Unit Reference	MD-SHE-0084-3800-1600-3800
Design Head (m)	1.600
Design Flow (l/s)	3.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	73.410
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	3.8	Kick-Flo®	0.750	2.7
Flush-Flo™	0.367	3.3	Mean Flow over Head Range	-	3.1

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	2.5	1.200	3.3	3.000	5.1	7.000	7.6
0.200	3.1	1.400	3.6	3.500	5.5	7.500	7.8
0.300	3.3	1.600	3.8	4.000	5.8	8.000	8.1
0.400	3.3	1.800	4.0	4.500	6.2	8.500	8.3
0.500	3.3	2.000	4.2	5.000	6.5	9.000	8.6
0.600	3.2	2.200	4.4	5.500	6.8	9.500	8.8
0.800	2.8	2.400	4.6	6.000	7.1		
1.000	3.1	2.600	4.8	6.500	7.3		

Storage Structures for Storm

Porous Car Park Manhole: PP1, DS/PN: 2.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	15.0
Max Percolation (l/s)	41.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	75.810	Cap Volume Depth (m)	0.380

Porous Car Park Manhole: PP2, DS/PN: 2.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	17.0
Max Percolation (l/s)	47.2	Slope (1:X)	392.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	75.705	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: PP3, DS/PN: 2.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.0
Max Percolation (l/s)	30.6	Slope (1:X)	381.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	75.675	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: PP4, DS/PN: 2.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	21.0
Max Percolation (l/s)	58.3	Slope (1:X)	304.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	75.595	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: PP5, DS/PN: 2.005

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	19.0
Max Percolation (l/s)	52.8	Slope (1:X)	377.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	75.565	Cap Volume Depth (m)	0.410

Cellular Storage Manhole: FLOW CONTROL, DS/PN: 2.007

Invert Level (m) 73.410 Safety Factor 2.0
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	34.0	75.0	1.601	0.0	139.0
1.600	34.0	139.0			

Time Area Diagram for Green Roof at Pipe Number 2.000 (Storm)

Area (m³) 86 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.001563	32	36	0.000316	64	68	0.000064	96	100	0.000013
4	8	0.001280	36	40	0.000258	68	72	0.000052	100	104	0.000011
8	12	0.001048	40	44	0.000212	72	76	0.000043	104	108	0.000009
12	16	0.000858	44	48	0.000173	76	80	0.000035	108	112	0.000007
16	20	0.000702	48	52	0.000142	80	84	0.000029	112	116	0.000006
20	24	0.000575	52	56	0.000116	84	88	0.000023	116	120	0.000005
24	28	0.000471	56	60	0.000095	88	92	0.000019			
28	32	0.000385	60	64	0.000078	92	96	0.000016			

Time Area Diagram for Green Roof at Pipe Number 3.000 (Storm)

Area (m³) 98 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.001781	32	36	0.000360	64	68	0.000073	96	100	0.000015
4	8	0.001458	36	40	0.000294	68	72	0.000059	100	104	0.000012
8	12	0.001194	40	44	0.000241	72	76	0.000049	104	108	0.000010
12	16	0.000977	44	48	0.000197	76	80	0.000040	108	112	0.000008
16	20	0.000800	48	52	0.000162	80	84	0.000033	112	116	0.000007
20	24	0.000655	52	56	0.000132	84	88	0.000027	116	120	0.000005
24	28	0.000536	56	60	0.000108	88	92	0.000022			
28	32	0.000439	60	64	0.000089	92	96	0.000018			

Time Area Diagram for Green Roof at Pipe Number 4.000 (Storm)

Area (m^3) 203 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.003689	32	36	0.000745	64	68	0.000150	96	100	0.000030
4	8	0.003020	36	40	0.000610	68	72	0.000123	100	104	0.000025
8	12	0.002473	40	44	0.000499	72	76	0.000101	104	108	0.000020
12	16	0.002025	44	48	0.000409	76	80	0.000083	108	112	0.000017
16	20	0.001658	48	52	0.000335	80	84	0.000068	112	116	0.000014
20	24	0.001357	52	56	0.000274	84	88	0.000055	116	120	0.000011
24	28	0.001111	56	60	0.000224	88	92	0.000045			
28	32	0.000910	60	64	0.000184	92	96	0.000037			

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	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	3
Number of Online Controls	2	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.430
Region	England and Wales	Cv (Summer)	0.900
M5-60 (mm)	20.000	Cv (Winter)	0.900

Margin for Flood Risk Warning (mm)	0.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS 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
Climate Change (%)	0

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
1.000	681A	15	75.510	72.110	-1.350	0.000	0.000	0.0	OK
2.000	RWDP1	120	76.500	75.925	-0.135	0.000	0.012	0.3	OK
2.001	PP1	30	76.400	75.860	-0.100	0.000	0.832	2.2	OK
3.000	RWDP2	120	76.500	75.955	-0.135	0.000	0.011	0.4	OK
2.002	PP2	120	76.350	75.759	-0.171	0.000	1.728	2.9	OK
4.000	RWDP3	60	76.500	75.921	-0.129	0.000	0.018	0.8	OK
2.003	PP3	120	76.320	75.738	-0.162	0.000	1.738	5.1	OK
2.004	PP4	120	76.240	75.674	-0.146	0.000	3.005	5.2	OK
2.005	PP5	180	76.220	75.616	0.546	0.000	2.263	4.3	SURCHARGED
2.006	CPIT	240	76.200	73.621	-0.064	0.000	0.176	4.3	OK
2.007	FLOW CONTROL	240	76.200	73.614	0.054	0.000	7.518	3.2	SURCHARGED
1.001	SITE CONNECTION	240	75.970	72.049	-1.326	0.000	0.103	3.2	OK
1.002	571C	240	76.100	72.036	-1.309	0.000	0.408	3.2	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	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 3
Number of Online Controls 2 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 521649 208769 TL 21649 08769
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

Margin for Flood Risk Warning (mm) 0.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS 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)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
1.000	681A	15	75.510	72.110	-1.350	0.000	0.000	0.0	OK
2.000	RWDP1	120	76.500	75.926	-0.134	0.000	0.013	0.4	OK
2.001	PP1	30	76.400	75.864	-0.096	0.000	0.950	2.5	OK
3.000	RWDP2	120	76.500	75.956	-0.134	0.000	0.013	0.5	OK
2.002	PP2	120	76.350	75.770	-0.160	0.000	2.297	3.9	OK
4.000	RWDP3	120	76.500	75.923	-0.127	0.000	0.021	1.0	OK
2.003	PP3	120	76.320	75.750	-0.150	0.000	2.140	6.9	OK
2.004	PP4	180	76.240	75.689	-0.131	0.000	4.002	7.1	OK
2.005	PP5	180	76.220	75.671	0.601	0.000	5.560	4.4	SURCHARGED
2.006	CPIT	240	76.200	73.721	0.036	0.000	0.289	4.4	SURCHARGED
2.007	FLOW CONTROL	240	76.200	73.713	0.153	0.000	10.948	3.3	SURCHARGED
1.001	SITE CONNECTION	240	75.970	72.050	-1.325	0.000	0.107	3.3	OK

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

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
1.002	571C	240	76.100	72.036	-1.309	0.000	0.409	3.3	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	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 3
Number of Online Controls 2 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 521649 208769 TL 21649 08769
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

Margin for Flood Risk Warning (mm) 0.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS 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)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
1.000	681A	15	75.510	72.110	-1.350	0.000	0.000	0.0	OK
2.000	RWDP1	30	76.500	75.936	-0.124	0.000	0.023	1.0	OK
2.001	PP1	30	76.400	75.907	-0.053	0.000	2.816	6.6	OK
3.000	RWDP2	30	76.500	75.965	-0.125	0.000	0.023	1.2	OK
2.002	PP2	180	76.350	75.833	-0.097	0.000	5.612	7.9	OK
4.000	RWDP3	30	76.500	75.938	-0.112	0.000	0.038	2.5	OK
2.003	PP3	180	76.320	75.830	-0.070	0.000	5.024	13.9	OK
2.004	PP4	180	76.240	75.822	0.002	0.000	13.002	12.0	SURCHARGED
2.005	PP5	180	76.220	75.815	0.745	0.000	14.209	4.9	SURCHARGED
2.006	CPIT	360	76.200	74.238	0.553	0.000	0.874	4.8	SURCHARGED
2.007	FLOW CONTROL	360	76.200	74.232	0.672	0.000	28.299	3.3	SURCHARGED
1.001	SITE CONNECTION	120	75.970	72.050	-1.325	0.000	0.107	3.3	OK

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

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
1.002	571C	180	76.100	72.036	-1.309	0.000	0.409	3.3	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	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 3
Number of Online Controls 2 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 521649 208769 TL 21649 08769
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

Margin for Flood Risk Warning (mm) 0.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS 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)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
1.000	681A	15	75.510	72.110	-1.350	0.000	0.000	0.0	OK
2.000	RWDP1	30	76.500	75.945	-0.115	0.000	0.034	1.4	OK
2.001	PP1	30	76.400	75.930	-0.030	0.000	3.903	8.9	OK
3.000	RWDP2	30	76.500	75.970	-0.120	0.000	0.028	1.6	OK
2.002	PP2	180	76.350	75.906	-0.024	0.000	9.524	8.7	OK
4.000	RWDP3	30	76.500	75.944	-0.106	0.000	0.044	3.3	OK
2.003	PP3	180	76.320	75.903	0.003	0.000	7.663	16.6	SURCHARGED
2.004	PP4	180	76.240	75.895	0.075	0.000	17.818	12.2	SURCHARGED
2.005	PP5	180	76.220	75.887	0.817	0.000	18.449	5.1	SURCHARGED
2.006	CPIT	480	76.200	74.579	0.894	0.000	1.261	4.9	SURCHARGED
2.007	FLOW CONTROL	480	76.200	74.572	1.012	0.000	39.678	3.3	SURCHARGED
1.001	SITE CONNECTION	2160	75.970	72.050	-1.325	0.000	0.107	3.3	OK

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

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
1.002	571C	60	76.100	72.036	-1.309	0.000	0.409	3.3	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	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 3
Number of Online Controls 2 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 521649 208769 TL 21649 08769
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

Margin for Flood Risk Warning (mm) 0.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS 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)	100
Climate Change (%)	40

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
1.000	681A	15	75.510	72.110	-1.350	0.000	0.000	0.0	OK
2.000	RWDP1	180	76.500	76.043	-0.017	0.000	0.145	1.2	OK
2.001	PP1	180	76.400	76.042	0.082	0.000	9.151	5.8	SURCHARGED
3.000	RWDP2	180	76.500	76.040	-0.050	0.000	0.107	1.4	OK
2.002	PP2	180	76.350	76.038	0.108	0.000	16.564	7.5	SURCHARGED
4.000	RWDP3	180	76.500	76.039	-0.011	0.000	0.151	2.9	OK
2.003	PP3	180	76.320	76.035	0.135	0.000	12.307	14.0	SURCHARGED
2.004	PP4	180	76.240	76.026	0.206	0.000	25.839	10.7	SURCHARGED
2.005	PP5	180	76.220	76.019	0.949	0.000	25.004	5.4	SURCHARGED
2.006	CPIT	480	76.200	74.995	1.310	0.000	1.737	5.3	SURCHARGED
2.007	FLOW CONTROL	480	76.200	74.987	1.427	0.000	53.539	3.8	SURCHARGED
1.001	SITE CONNECTION	480	75.970	72.052	-1.323	0.000	0.117	3.8	OK

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

PN	US/MH Name	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
1.002	571C	480	76.100	72.036	-1.309	0.000	0.410	3.8	OK

100 year Return Period Summary of Critical Results by Maximum Discharge Volume (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	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 3
Number of Online Controls 2 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 521649 208769 TL 21649 08769
Data Type	Point
Cv (Summer)	0.900
Cv (Winter)	0.900

Margin for Flood Risk Warning (mm) 0.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Duration (mins)	US/CL (m)	Discharge Vol (m³)	Status
2.007	FLOW CONTROL	360	76.200	126.196	SURCHARGED

Edney, Elizabeth

From: DEVELOPER.SERVICES@THAMESWATER.CO.U <DEVELOPER.SERVICES@THAMESWATER.CO.UK>
Sent: 12 November 2020 10:54
To: Edney, Elizabeth
Subject: RE: FAO Zaid Kazi - DS6070774 Volkswagen Centre at Comet Way, Hatfield, AL10 9TF

Dear Elizabeth

I confirm, Thames Water would not have capacity concerns for proposed revised discharge rate of max 3.8l/s for 1:100.

Kind Regards

Artur Jaroma
Developer Services – Sewer Adoptions Engineer
Office: 0800 009 3921
Mobile: 077476 47276

Get advice on making your sewer connection correctly at connectright.org.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

Original Text

From: "Edney, Elizabeth" <elizabeth.edney@stantec.com>
To: DEVELOPER.SERVICES@THAMESWATER.CO.U <DEVELOPER.SERVICES@THAMESWATER.CO.UK>
CC:
Sent: 10.11.20 09:52:32
Subject: FAO Zaid Kazi - DS6070774 Volkswagen Centre at Comet Way, Hatfield, AL10 9TF

Good Morning Zaid

You provided the attached response to a pre-development enquiry that we sent with regards to redevelopment at the former Volkswagen Centre on Comet Way in Hatfield (ref. DS6070774).

The runoff rate specified was 1 l/s however on review of the attenuation requirements this was considered to be too onerous and the runoff rate proposed is now a maximum of 3.8 l/s (the 1 in 100 year greenfield rate for the site area). This still provides in excess of a 90% reduction in surface water runoff rates in comparison to the existing scenario. A copy of the equivalent greenfield runoff rates for the site area, and the total existing and proposed runoff rates for the site area is provided in the table below.

Return Period	Greenfield Runoff Rate l/s/ha	Equivalent Greenfield Runoff Rate 0.47ha (l/s)
1 in 1 year	2.1	1.0
Q_{BAR}	2.5	1.2

1 in 30 year	6.1	2.9
1 in 100 year	8.1	3.8

Return Period	Total Existing Runoff Rate 0.47ha (l/s)	Total Proposed Runoff Rate 0.37ha (l/s)
1 in 1 year	67.5	2.4
1 in 2 year	73.4	2.8
1 in 30 year	144.0	3.4
1 in 100 year	169.1	3.5
1 in 100 year +40%cc	195.8	3.7

We would be grateful if you could confirm at your earliest convenience that Thames Water are happy with this.

Many thanks in advance.

Elizabeth Edney BSc MSc MCIWEM
Senior Flood Risk and Drainage Engineer
Caversham Bridge House, Waterman Place, Reading RG1 8DN
Direct: +44 118 9520 314
elizabeth.edney@stantec.com

Appendix F SuDS Management Plan

Stantec report ref. 47179/4001/SMP dated November 2020

Land at former Volkswagen Commercial Vehicle Dealership, Comet Way, Hatfield:
Sustainable Drainage Management and Maintenance Plan

November 2020

1 Sustainable Drainage Management and Maintenance Plan

1.1 This Plan sets out the long- term maintenance arrangements for the surface water drainage system to maintain the continuing operation to design performance standards of the proposed residential development at the former commercial vehicle dealership on Comet Way in Hatfield.

2 Drainage Strategy

2.1.1 Sustainable Drainage Systems (SuDS) are incorporated into the surface water drainage design, to prevent flooding and to provide attenuation storage within the site. The attenuation will enable a restricted runoff rate, which is in accordance with Hertfordshire County Council and Thames Water requirements. The SuDS features also provide treatment stages to minimise pollution by intercepting silt and trap pollutants in the runoff.

2.1.2 Green roofs are proposed on parts of the roof area. These features will provide interception storage for the smaller more regular rainfall events (less than 5mm) and acts as a treatment stage before discharge to the underground attenuation storage structure described below. The design of the green roof is subject to the manufacturer's specification and therefore the associated maintenance will be updated accordingly.

2.1.3 Most hardstanding will consist of lined permeable paving which will provide treatment/removal of potential contaminants and will also reduce the rate of discharge to the on-site drainage network.

2.1.4 To restrict the discharge rate from the proposed development as far as reasonably practical, the majority of attenuation will be provided through an underground cellular attenuation with a hydro-brake control unit beneath the car parking spaces to the west of the proposed building. The cellular attenuation is sized to accommodate the flow from a 1 in 100 (1.0%) Annual Probability rainfall event, including 40% climate change with no flooding.

2.1.5 This note is to be used as a guidance document only. The operation and maintenance of the drainage system should be undertaken by qualified professionals, in accordance with the manufacturer's requirements/ specifications.

3 Operation and Maintenance

3.1.1 The tables below summarise some (not all) of the considerations relating to the maintenance of the proposed drainage system. Further detail on the operation and maintenance requirements of each of these components can be found in the CIRIA SuDS Manual C753.

3.1.2 The maintenance regime should be reviewed annually to make sure it continues to meet the drainage objectives. If necessary, amendments to the maintenance regime should be made.

Channel drains, perforated pipes, sumps and flow control chamber

3.1.3 All channel drains, sumps, pipe inlets and outlets are to be inspected monthly to remove any build-up of silt and debris.

3.1.4 Flow control chamber should be inspected once a year as a minimum or more frequently if required to remove silt and debris as well as checking for obstructions to free flow.

Green Roof

Green Roof	
Regular Maintenance	**Frequency**
Inspect all components including soil substrate, vegetation/surfacing, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after serve storms
Inspect underside of roof for evidence of leakage	Annually and after serve storms
Inspect drain inlets to ensure unrestricted runoff from the drainage layer to roof drain system	Annually and after serve storms
Cleaning: Brush regularly and remove sweepings from all hard surfaces on roof structure. Clean inlets as required.	Monthly
Occasional Tasks	**Frequency**
Remove debris and litter to prevent clogging of inlet drains and for green roof interference of plant growth	Six monthly, annually or as required
Remove nuisance and invasive vegetation	Six monthly or as required
Remedial Work	**Frequency**
For green roof If erosion channels are evident, these should be stabilised with extra soil substrate, and sources of erosion should be identified and controlled	As required
If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Permeable Paving

Permeable Paving	
Regular Maintenance	**Frequency**
Cleaning: Brush regularly and remove sweepings from all hard surfaces. Clean inlets	Monthly
Occasional Tasks	**Frequency**
Brush and Vacuum Surface	End of winter (April) to collect winter debris Mid - summer to collect dust, flower and grass type deposits. After autumn leaf fall (November)
Remedial Work	**Frequency**
Monitor effectiveness of permeable pavement (use an observation well) and when water does not infiltrate immediately advise client	As required

Attenuation Storage Tanks

Attenuation Storage Tanks	
Regular Maintenance	**Frequency**
Check inlets and outlets	Monthly or annually as required
Occasional Tasks	**Frequency**
Jetting and section where silt has settled	As required
Remedial Work	**Frequency**
Reinstate	As required

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