

Our Ref: 20108-SWD-CO-01 C01

27 November 2023

London Borough of Bromley

Water Environment Limited
6 Coppergate Mews
Brighton Road
Surbiton
London
KT6 5NE

Tel: 020 8545 9720

www.WaterEnvironment.co.uk

By Email:

To whom it may concern,

2-4 RINGS ROAD
RESPONSE TO LLFA COMMENTS

This letter has been prepared in response to the Lead Local Flood Authority's (LLFA) comments on the proposed Sustainable Drainage System (SuDS) Strategy for the site at Ringers Road, Bromley, planning reference 21/05585/FULL1. The comment from the LLFA was as follows:

"The acceptance of Thames Water of a discharge rate of 5l/s is subject to LLFA's approval of the sequential approach to the disposal of surface water. We consider in this case that the proposed discharge of 5l/s is high and would require the applicant to increase its storage volume to restrict the rate to maximum of 2l/s for all events including the 1 in 100 year plus 40% climate change. I do not accept the findings of the submitted FRA."

Water Environment Ltd have revised the SuDS strategy for the site and incorporated an area of crated storage in the courtyard area. The strategy proposes a stormwater drainage discharge rate of 2 l/s from site, connecting to the existing Thames Water stormwater sewer in Ringer's Road.

The updated MicroDrainage calculations and SuDS strategy drawing are appended to this letter. It is considered that the appended information satisfies the concerns raised by the LLFA.

Yours sincerely,



Agnes Gannon

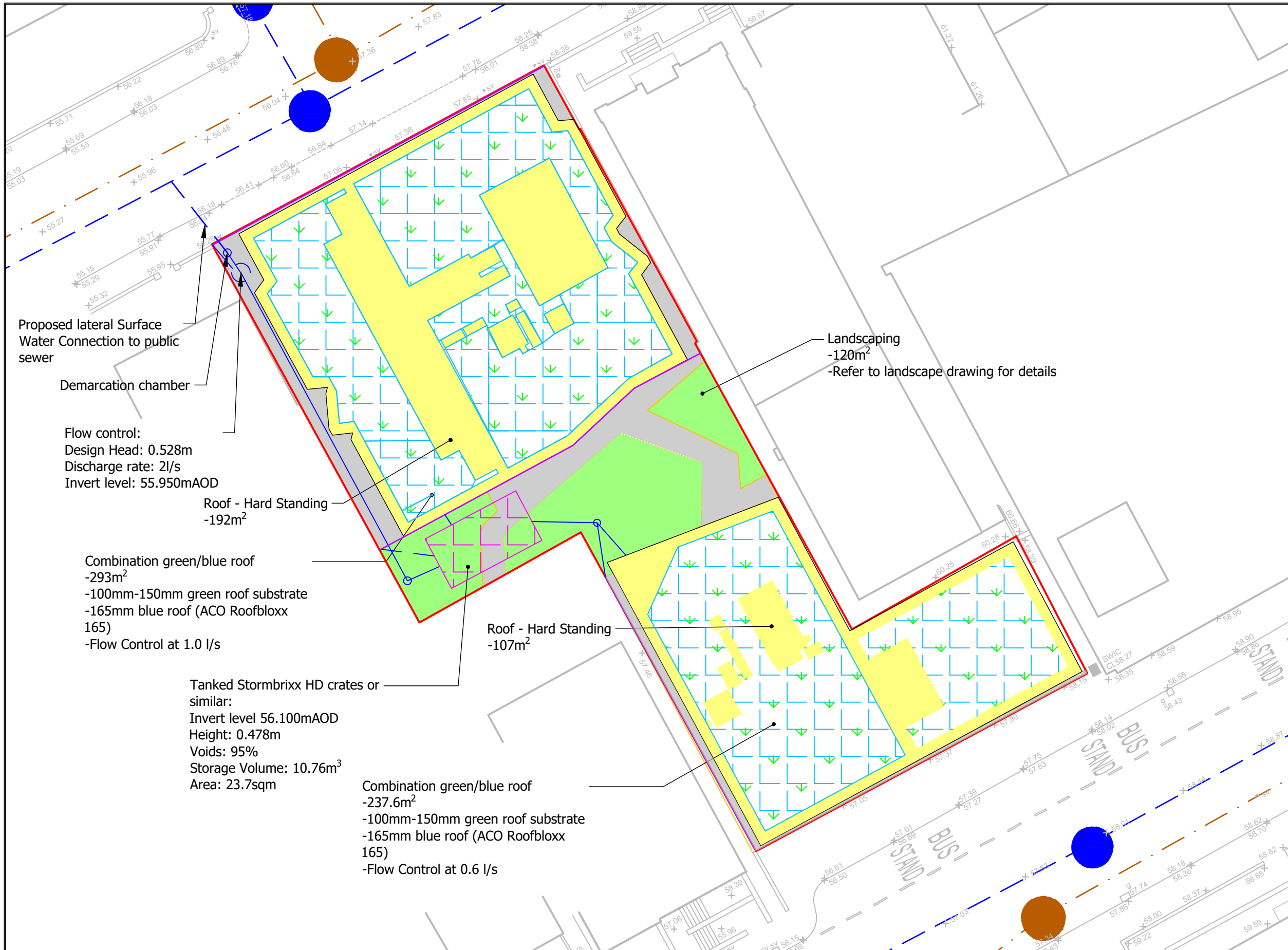
B Eng (Civil)

Principal Engineer


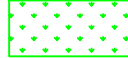







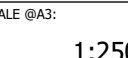
Encl.

20108-SWD-DP-01-C02

20108-SWD-MH-01-C01



Legend

-  Tanked drainage sub-base (30% voids)
-  Green Roof
-  Blue Roof
-  Tanked crated storage
-  Hard paving
-  Roof - No SuDS
-  Permeable Landscaping
-  Private Surface Water Sewer
-  Adopted Surface Water Sewer
-  Adopted Foul Sewer

NOTES

1. Dimensions in metres and levels in m AOD unless otherwise stated. Do not scale.
2. This drawing is for planning only, not for construction
3. Drawing to read with Water Environment SuDS Report Rev E
4. Site layout as per Hollaway Studio Drawing NO18.085 100.04 R3 and ETLA Drawing No RNG-EDL-ZZ-XX-DR-L-207_P2
5. Strategy based on Mircodrainge Network Modelling
6. All pipes shown as indicative
7. Thames Water (TW) asset details taken from TW Asset Plan - connection level to be surveyed

CO2	27/11/23	Strategy amended following LLFA comments	AMG	TC
REV	DATE	AMENDMENTS	DR	AP

CLIENT:	Ringer Road Properties Ltd
PROJECT:	2-4 Ringer Road
DRAWING:	Outline SuDS


SCALE @A3:	1:250	DATE:	14/04/23
DRAWN:	CB	CHECKED:	GE
APPROVED:	GL	REVISION:	C02
DRAWING NO:	20108-SWD-PD-01		

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
2.000	User	-	100	0.004	0.004	0.004
	User	-	100	0.003	0.003	0.007
	User	-	100	0.002	0.002	0.009
	User	-	100	0.000	0.000	0.010
	User	-	100	0.000	0.000	0.010
	User	-	100	0.001	0.001	0.011
	User	-	100	0.000	0.000	0.012
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.013	0.013	0.013
	User	-	100	0.004	0.004	0.017
	User	-	100	0.001	0.001	0.017
	User	-	100	0.000	0.000	0.017
	User	-	100	0.001	0.001	0.019
4.000	-	-	100	0.000	0.000	0.000
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.024	0.024	0.024
				Total	Total	Total
				0.054	0.054	0.054

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
S1.003	S	58.200	55.539	0.000	0	0

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Micro Drainage		Network 2017.1.2

Online Controls for Storm

Orifice Manhole: S2, DS/PN: S1.001, Volume (m³): 0.3

Diameter (m) 0.027 Discharge Coefficient 0.600 Invert Level (m) 59.000

Orifice Manhole: S5, DS/PN: S3.001, Volume (m³): 0.3

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 59.000

Hydro-Brake® Optimum Manhole: S3, DS/PN: S1.003, Volume (m³): 1.5

Unit Reference	MD-SHE-0073-2000-0628-2000
Design Head (m)	0.628
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	73
Invert Level (m)	55.950
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)	0.628	2.0	Kick-Flo®	0.413	1.7
Flush-Flo™	0.187	2.0	Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	1.200	2.7	3.000	4.1	7.000	6.1
0.200	2.0	1.400	2.9	3.500	4.4	7.500	6.3
0.300	1.9	1.600	3.1	4.000	4.7	8.000	6.5
0.400	1.7	1.800	3.2	4.500	5.0	8.500	6.7
0.500	1.8	2.000	3.4	5.000	5.2	9.000	6.9
0.600	2.0	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.2	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.8	6.500	5.9		

Storage Structures for Storm

Cellular Storage Manhole: S2, DS/PN: S1.001

Invert Level (m) 59.000 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.97
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	237.6	0.0	0.166	0.4	0.0
0.165	237.6	0.0			

Cellular Storage Manhole: S5, DS/PN: S3.001

Invert Level (m) 59.000 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	293.0	0.0	0.166	0.4	0.0
0.165	293.0	0.0			

Cellular Storage Manhole: S3, DS/PN: S1.003

Invert Level (m) 56.100 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	23.7	0.0	0.479	0.4	0.0
0.478	23.7	0.0			

Time Area Diagram for Green Roof at Pipe Number S1.000 (Storm)

Area (m³) 238 Evaporation (mm/day) 3
 Depression Storage (mm) 5 Decay Coefficient 0.050

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:	From:	To:
0	4 0.004325	16	20 0.001943	32	36 0.000873	48	52 0.000392
4	8 0.003541	20	24 0.001591	36	40 0.000715	52	56 0.000321
8	12 0.002899	24	28 0.001303	40	44 0.000585	56	60 0.000263
12	16 0.002374	28	32 0.001067	44	48 0.000479	60	64 0.000215


Time Area Diagram for Green Roof at Pipe Number S1.000 (Storm)

Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)
64 68	0.000176	80 84	0.000079	96 100	0.000036	112 116	0.000016
68 72	0.000144	84 88	0.000065	100 104	0.000029	116 120	0.000013
72 76	0.000118	88 92	0.000053	104 108	0.000024		
76 80	0.000097	92 96	0.000043	108 112	0.000020		

Time Area Diagram for Green Roof at Pipe Number S4.000 (Storm)

Area (m³) 293 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)	Time (mins) From: To:	Area (ha)
0 4	0.005324	32 36	0.001075	64 68	0.000217	96 100	0.000044
4 8	0.004359	36 40	0.000880	68 72	0.000178	100 104	0.000036
8 12	0.003569	40 44	0.000721	72 76	0.000145	104 108	0.000029
12 16	0.002922	44 48	0.000590	76 80	0.000119	108 112	0.000024
16 20	0.002392	48 52	0.000483	80 84	0.000098	112 116	0.000020
20 24	0.001959	52 56	0.000395	84 88	0.000080	116 120	0.000016
24 28	0.001604	56 60	0.000324	88 92	0.000065		
28 32	0.001313	60 64	0.000265	92 96	0.000054		

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Micro Drainage	Network 2017.1.2	

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 Coefficient 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 2
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 540233 168902 TQ 40233 68902
Data Type Point
Cv (Summer) 1.000
Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON


Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	120 Summer	2	+0%					59.081
S2.000	S2	15 Summer	2	+0%					59.074
S1.001	S2	1440 Summer	2	+0%					59.033
S1.002	S4	1440 Summer	2	+0%	100/15 Summer				56.208
S3.000	S4	15 Summer	2	+0%					59.079
S4.000	S5	120 Summer	2	+0%					59.084
S3.001	S5	960 Summer	2	+0%					59.037
S3.002	S8	960 Summer	2	+0%	100/15 Summer				56.211
S1.003	S3	15 Summer	2	+0%	2/15 Summer				56.123

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

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S1.000	S1	-0.119	0.000	0.10		1.4	FLOOD RISK	
S2.000	S2	-0.126	0.000	0.09		2.4	FLOOD RISK	
S1.001	S2	-0.117	0.000	0.01		0.2	FLOOD RISK	
S1.002	S4	-0.142	0.000	0.01		0.2	OK	
S3.000	S4	-0.121	0.000	0.14		4.0	FLOOD RISK	
S4.000	S5	-0.116	0.000	0.12		1.7	FLOOD RISK	
S3.001	S5	-0.113	0.000	0.01		0.3	FLOOD RISK	
S3.002	S8	-0.139	0.000	0.02		0.3	OK	
S1.003	S3	0.023	0.000	0.09		2.0	SURCHARGED	

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Micro Drainage	Network 2017.1.2	

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 Coefficient 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 2
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 540233 168902 TQ 40233 68902
Data Type Point
Cv (Summer) 1.000
Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON


Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	30 Summer	30	+0%					59.101
S2.000	S2	15 Summer	30	+0%					59.089
S1.001	S2	480 Summer	30	+0%					59.066
S1.002	S4	30 Summer	30	+0%	100/15 Summer				56.247
S3.000	S4	15 Summer	30	+0%					59.098
S4.000	S5	30 Summer	30	+0%					59.107
S3.001	S5	480 Summer	30	+0%					59.072
S3.002	S8	30 Summer	30	+0%	100/15 Summer				56.247
S1.003	S3	30 Summer	30	+0%	2/15 Summer				56.247

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

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S1.000	S1	-0.099	0.000	0.25		3.6	FLOOD RISK	
S2.000	S2	-0.111	0.000	0.21		6.0	FLOOD RISK	
S1.001	S2	-0.084	0.000	0.01		0.3	FLOOD RISK	
S1.002	S4	-0.103	0.000	0.01		0.2	OK	
S3.000	S4	-0.102	0.000	0.35		9.8	FLOOD RISK	
S4.000	S5	-0.093	0.000	0.31		4.4	FLOOD RISK	
S3.001	S5	-0.078	0.000	0.02		0.6	FLOOD RISK	
S3.002	S8	-0.103	0.000	0.02		0.3	OK	
S1.003	S3	0.147	0.000	0.09		2.0	SURCHARGED	

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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 Coefficient 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 2
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

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Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1 960	Summer	100	+40%					59.130
S2.000	S2 960	Summer	100	+40%					59.130
S1.001	S2 960	Summer	100	+40%					59.130
S1.002	S4 120	Summer	100	+40%	100/15	Summer			56.518
S3.000	S4 480	Summer	100	+40%					59.139
S4.000	S5 480	Summer	100	+40%					59.140
S3.001	S5 480	Summer	100	+40%					59.139
S3.002	S8 120	Summer	100	+40%	100/15	Summer			56.518
S1.003	S3 120	Summer	100	+40%	2/15	Summer			56.517

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

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S1.000	S1	-0.070	0.000	0.14		1.9	FLOOD RISK	
S2.000	S2	-0.070	0.000	0.03		1.0	FLOOD RISK	
S1.001	S2	-0.020	0.000	0.02		0.5	FLOOD RISK	
S1.002	S4	0.168	0.000	0.03		0.5	SURCHARGED	
S3.000	S4	-0.061	0.000	0.10		2.8	FLOOD RISK	
S4.000	S5	-0.060	0.000	0.27		3.7	FLOOD RISK	
S3.001	S5	-0.011	0.000	0.03		0.9	FLOOD RISK	
S3.002	S8	0.168	0.000	0.04		0.8	SURCHARGED	
S1.003	S3	0.417	0.000	0.09		2.0	SURCHARGED	