Surface and Foul Water Calculation Pack

J3304 Greville Street

Ref: J3304-C-CA-0001

Revision: 03

Status: S9

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DOCUMENT CONTROL

Document number:	J3304-C-CA-0001		
Status:	For Information	**Reason for issue:**	For Building Control Approval
Date:	18.11.2020	**Revision:**	03

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Approver:	Andrew Lerpiniere	**Signature**	AL

REVISION HISTORY

Date	Status	Revision
09.09.2020	S9	00
10.11.2020	S9	01
13.11.2020	S9	02
18.11.2020	S9	03

1. INTRODUCTION

This document contains the surface and foul water calculations for the Greville Street development. The following calculations are included:

- Surface Water Attenuation
- Surface Water flow rates and pipe sizing
- Foul Water flow rates and pipe sizing

This document should be read in conjunction with documents:

- J3304-C-RP-0001
- J3304-C-DR-0090
- J3304-C-DE-0400
- J3304-M-DR-1B10
- J3304-M-DR-1000
- J3304-M-DR-1010
- J3304-M-DR-1020
- J3304-M-DR-1050
- J3304-M-DR-1060
- 248_1060
- 248_1065
- 248_1120
- 248_1121

Site Characteristics	Parameter	Entre Values Here	Units	
Hydrological Parameters				
Hydrological Region	R	6		
(SOIL) Type	S	2		
Standard Average Annual Rainfall	SAAR	608	mm	
	SPR			Not required to fill if SOIL is filled
Rainfall Total for the 5 year 60 minute return period	M5-60	20.9		
	r	0.44		
Select Rainfall Return periods for Analysis				
Rainfall period Selection	Mx-D	1		
		10		
		30		
		100		
Site Parameters				
What are the units?		ha		
Site Area	A	0.01	ha	
Public Open Space	Aop	0	ha	
Site Area Excluding Public Spaces	A	0.01	ha	
		EXISTING	PROPOSED	
IMPERMEABLE AREA	Ai	0.01	0.01	ha
PERMEABLE AREA	Ap	0	0	ha
Percentage Imperviousness	PIMP	100.00	100.00	%
Runoff Coeffiient	C	1		1 is the Assumption
Climate Change	CC	20	%	
		40	%	

Greenfield Runoffs for entire site

Flood Peak Flow Rate						
1:1 Year Event	Q1yr	0.01	l/s			
1:10 Year Event	Q10yr	0.03	l/s			
1:30 Year Event	Q30yr	0.03	l/s			
1:100 Year Event	Q100yr	0.05	l/s			

Greenfield for Permeable area

Flood Peak Flow Rate						
1:1 Year Event	Q1yr	0.00	0.00		l/s	
1:10 Year Event	Q10yr	0.00	0.00		l/s	
1:30 Year Event	Q30yr	0.00	0.00		l/s	
1:100 Year Event	Q100yr	0.00	0.00		l/s	

Flow Rate from Impermeable Area

1:1 Year Flood Event Peak flow from permeable surfaces	Q1yr	0.37	0.37		l/s	Surface Runoff from only the impermeable areas
1:10 Year Flood Event Peak flow from permeable surfaces	Q10yr	0.72	0.72		l/s	
1:30 Year Flood Event Peak flow from permeable surfaces	Q30yr	0.92	0.92		l/s	
1:100 Year Flood Event Peak flow from permeable surface	Q100yr	1.18	1.18		l/s	
1:100 Year Flood Event + 20% Climate Change	Q100yr CC	1.41	1.41		l/s	
1:100 Year Flood Event + 40% Climate Change	Q100yr CC	1.65	1.65		l/s	

Flow Rate from entire Site

1:1 Year Flood Event Peak flow	Q1yr	0.37	0.37	0.19	l/s	Surface Runoff from Impermeable areas plus greenfield area added ontop
1:10 Year Flood Event Peak flow	Q10yr	0.72	0.72	0.36	l/s	
1:30 Year Flood Event Peak flow	Q30yr	0.92	0.92	0.46	l/s	
1:100 Year Flood Event Peak flow	Q100yr	1.18	1.18	0.59	l/s	
1:100 Year Flood Event + 20% Climate Change	Q100yr CC	1.41	1.41	0.71	l/s	
1:100 Year Flood Event + 40% Climate Change	Q100yr CC	1.65	1.65	0.82	l/s	

Flow Rate from Entire Site

1:1 Year Flood Event Peak flow from permeable surfaces	**Q1yr**	**0.36**	**0.36**	**0.18**	**l/s**	**Surface Runoff from only the impermeable areas**
1:10 Year Flood Event Peak flow from permeable surface	**Q10yr**	**0.69**	**0.69**	**0.35**	**l/s**	
1:30 Year Flood Event Peak flow from permeable surface	**Q30yr**	**0.88**	**0.88**	**0.44**	**l/s**	
1:100 Year Flood Event Peak flow from permeable surfac	**Q100yr**	**1.13**	**1.13**	**0.57**	**l/s**	
1:100 Year Flood Event + 20% Climate Change	**Q100yr CC**	**1.36**	**1.36**	**0.68**	**l/s**	
1:100 Year Flood Event + 40% Climate Change	**Q100yr CC**	**1.59**	**1.59**	**0.79**	**l/s**	

Long Term storage volume	LTVol100yr6hr	3.15	3.15	M^3	0	

Site Characteristics	Parameter	Value			Unit	Notes
		Existing	Proposed	50% Betterment		
GREENFIELD CACULATION FOR PERMEABLE AREA						
Hydrological Region	R	6	6			
(SOIL) Type	S	2	2			
Area	A	0.00	0.00		ha	
Annual Rainfall	SAAR	608.00	608.00		mm	
Soil Runoff Coefficient	SPR	0.3	0.3			
(Development Mean Annual Peak Flow) > 50	Qbar	0.00	0.00			
(Development Mean Annual Peak Flow) <50	Qbar50	77.27	77.27		l/s	
	Qbar	0.00	0.00		l/s	
Development Mean Annual Peak Flow	Qbar	0.00	0.00		l/s	
Mean Annual Peak Flow per unit area	Qbar/A	#DIV/0!	#DIV/0!		l/s/ha	
Minimum limit of discharge	Qthrottle	0.00	0.00		l/s	
1:100 Year flow rate per unit area		#DIV/0!	#DIV/0!		l/s/ha	
Equivalent mean annual peak flow	Qbar	0.00	0.00		l/s	
Equivalent mean annual peak flow per unit area	Qbar/A	#DIV/0!	#DIV/0!		l/s/ha	
Growth Curve 1	GC1	0.85	0.85			
Growth Curve 29	GC29	1.62	1.62			
Growth Curve 30	GC30	2.24	2.24		2.30 (SuDS Tool) - London	
Growth Curve 100	GC100	3.19	3.19		3.19 (SuDS Tool) - London	
OUTPUT						
Flood Peak Flow Rate						
1:1 Year Event	Q1yr	0.00	0.00		l/s	
1:10 Year Event	Q10yr	0.00	0.00		l/s	
1:30 Year Event	Q30yr	0.00	0.00		l/s	
1:100 Year Event	Q100yr	0.00	0.00		l/s	
Flood Peak Flow Rate per unit Area						
1:1 Year Flood Event	Q1yr	#DIV/0!	#DIV/0!		l/s/ha	
1:10 Year Flood Event	Q10yr	#DIV/0!	#DIV/0!		l/s/ha	
1:30 Year Flood Event	Q30yr	#DIV/0!	#DIV/0!		l/s/ha	
1:100 Year Flood Event	Q100yr	#DIV/0!	#DIV/0!		l/s/ha	
BROWNFIELD CALCULATION FOR IMPERMEABLE AREA						
Impermeable Area	Ai	0.01	0.01		ha	
Rainfall Intensity	M1-60	13.45	13.45		mm	LONDON Values
Rainfall Intensity	M10-60	25.92	25.92		mm	
Rainfall Intensity	M30-60	32.98	32.98		mm	
Rainfall Intensity	M100-60	42.35	42.35		mm	
Rainfall Intensity for CC	M100-60	42.35	42.35		mm	
Runoff Coefficient	C	1	1			An Assumption - Assumes totally impermeable area contributes to the drainage system

OUTPUT

Flow Rate from Impermeable Area

1:1 Year Flood Event Peak flow from permeable surfaces	Q1yr	0.37	0.37		l/s	Surface Runoff from only the impermeable areas
1:10 Year Flood Event Peak flow from permeable surfaces	Q10yr	0.72	0.72		l/s	
1:30 Year Flood Event Peak flow from permeable surfaces	Q30yr	0.92	0.92		l/s	
1:100 Year Flood Event Peak flow from permeable surfaces	Q100yr	1.18	1.18		l/s	
1:100 Year Flood Event + 20% Climate Change	Q100yr CC	1.41	1.41		l/s	
1:100 Year Flood Event + 40% Climate Change	Q100yr CC	1.65	1.65		l/s	

Flow Rate per Unit Area Impermeable Area

1:1 Year Flood Event Peak flow from permeable surfaces	Q1yr	37.39	37.39		l/s/ha	
1:10 Year Flood Event Peak flow from permeable surfaces	Q10yr	72.05	72.05		l/s/ha	
1:30 Year Flood Event Peak flow from permeable surfaces	Q30yr	91.70	91.70		l/s/ha	
1:100 Year Flood Event Peak flow from permeable surfaces	Q100yr	117.74	117.74		l/s/ha	

ENTIRE SITE RUNOFF

Flow Rate from entire Site

1:1 Year Flood Event Peak flow	Q1yr	0.37	0.37	0.19	l/s	Surface Runoff from Impermeable areas plus greenfield area added ontop
1:10 Year Flood Event Peak flow	Q10yr	0.72	0.72	0.36	l/s	
1:30 Year Flood Event Peak flow	Q30yr	0.92	0.92	0.46	l/s	
1:100 Year Flood Event Peak flow	Q100yr	1.18	1.18	0.59	l/s	
1:100 Year Flood Event + 20% Climate Change	Q100yr CC	1.41	1.41	0.71	l/s	
1:100 Year Flood Event + 40% Climate Change	Q100yr CC	1.65	1.65	0.82	l/s	

Site Characteristics	Parameter	Value			Unit	Notes
		Existing	Proposed	50% Betterment		
Site Area	Ai	0.01	0.01		ha	
Rainfall Intensity	M1-60	13.45	13.45		mm	LONDON Values
Rainfall Intensity	M10-60	25.92	25.92		mm	
Rainfall Intensity	M30-60	32.98	32.98		mm	
Rainfall Intensity	M100-60	42.35	42.35		mm	
Rainfall Intensity for CC	M100-60	42.35	42.35		mm	
Runoff Coefficient	C	0.96	0.96			An Assumption - Assumes totally impermeable area contributes to the drainage system

OUTPUT

Flow Rate from Entire Site

1:1 Year Flood Event Peak flow from permeable surfaces	Q1yr	0.36	0.36	0.18	l/s	Surface Runoff from only the impermeable areas
1:10 Year Flood Event Peak flow from permeable surfaces	Q10yr	0.69	0.69	0.35	l/s	
1:30 Year Flood Event Peak flow from permeable surfaces	Q30yr	0.88	0.88	0.44	l/s	
1:100 Year Flood Event Peak flow from permeable surfaces	Q100yr	1.13	1.13	0.57	l/s	
1:100 Year Flood Event + 20% Climate Change	Q100yr CC	1.36	1.36	0.68	l/s	
1:100 Year Flood Event + 40% Climate Change	Q100yr CC	1.59	1.59	0.79	l/s	

Flow Rate per Unit Area Impermeable Area

1:1 Year Flood Event Peak flow from permeable surfaces	Q1yr	35.96	35.96		l/s/ha	
1:10 Year Flood Event Peak flow from permeable surfaces	Q10yr	69.28	69.28		l/s/ha	
1:30 Year Flood Event Peak flow from permeable surfaces	Q30yr	88.18	88.18		l/s/ha	
1:100 Year Flood Event Peak flow from permeable surfaces	Q100yr	113.22	113.22		l/s/ha	

Job Title:	Greville St
Job Number:	J3304
Date:	13/11/2020
Type of Calcs	Surface Drainage
Done by:	AM

WEBB YATES ENGINEERS

RWP flow rate check to BS EN 12056-3

Max flow rates from lower open areas for RWP sizing
Q = r.A.C BS EN 12056-3 4.1

C=	1		
R=	0.021	l/s/m2	
A_1, gf colonnade =	23.5	m2	Take 50% of area of the wall. Per 4.3.4
A2, 2f lightwell =	13	m2	
A3 5f terrace =	66	m2	
A4, non green roof area	165	m2	

4.3.4 In areas where wind is taken into account in rainfall calculations, where rain driven against a wall by the wind can run down onto the roof or into a gutter, 50% of the area of the wall shall be added to the effective area of the roof.

Q1 gf	0.50	l/s	
Q2 2f	0.30	l/s	
Q3 f5	1.40	l/s	
Q3 f5	3.50	l/s	
Green roof max outflow	1	l/s	Refer SuDS strategy

Minimum flow rates are setout on the appropriate drawings and proposed supplier of above ground RWP's is to confirm their products meets these requirements.

Existing below gorund connections are assumed to be 100dia at 1 in 100. It is unlkely that they are any smaller or shallower than this.

As per pipe capacity table from https://www.cpda.co.uk/design/hydraulic-design/
The design flow rates will be directed to separate below ground connections and are within range of the discharge pipes.

PIPE FLOWING FULL Ks VALUE = 1.5mm

ks value 1.5mm	Pipe Size (mm)															
	DN 100		DN 150		DN 225		DN 300		DN 375		DN 400		DN 450		DN 500	
GRAD	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS
	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s
1/10	2.12	16.64	2.79	49.24	3.65	145.00	4.40	311.20	5.09	562.00	5.31	666.65	5.72	910.19	6.12	1202.28
1/20	1.50	11.77	1.97	34.82	2.58	102.53	3.11	220.05	3.60	397.40	3.75	471.39	4.05	643.60	4.33	850.14
1/30	1.22	9.61	1.61	28.43	2.11	83.71	2.54	179.67	2.94	324.47	3.06	384.89	3.30	525.50	3.54	694.14
1/40	1.06	8.32	1.39	24.62	1.82	72.50	2.20	155.60	2.54	281.00	2.65	333.32	2.86	455.10	3.06	601.14
1/50	0.95	7.44	1.25	22.02	1.63	64.84	1.97	139.17	2.28	251.34	2.37	298.13	2.56	407.05	2.74	537.67
1/60	0.86	6.79	1.14	20.10	1.49	59.19	1.80	127.05	2.08	229.44	2.17	272.16	2.34	371.59	2.50	490.83
1/70	0.80	6.29	1.05	18.61	1.38	54.80	1.66	117.62	1.92	212.42	2.01	251.97	2.16	344.02	2.31	454.42
1/80	0.75	5.88	0.99	17.41	1.29	51.26	1.56	110.03	1.80	198.70	1.88	235.70	2.02	321.80	2.16	425.07
1/90	**0.71**	**5.55**	0.93	16.41	1.22	48.33	1.47	103.73	1.70	187.33	1.77	222.22	1.91	303.40	2.04	400.76
1/100	**0.67**	**5.26**	0.88	15.57	1.15	45.85	1.39	98.41	1.61	177.72	1.68	210.82	1.81	287.83	1.94	380.19

Job Title:	Greville St
Job Number:	J3304
Date:	09/09/2020
Type of Calcs	Foul Drainage
Done by:	AM

Foul drainage calcs based on BS EN 12056-2 (2000)

Table 2 — Discharge units (DU)

Appliance	System I	System II	System III	System IV
	DU l/s	DU l/s	DU l/s	DU l/s
Wash basin, bidet	0,5	0,3	0,3	0,3
Shower without plug	0,6	0,4	0,4	0,4
Shower with plug	0,8	0,5	1,3	0,5
Single urinal with cistern	0,8	0,5	0,4	0,5
Urinal with flushing valve	0,5	0,3	-	0,3
Slab urinal	0,2*	0,2*	0,2*	0,2*
Bath	0,8	0,6	1,3	0,5
Kitchen sink	0,8	0,6	1,3	0,5
Dishwasher (household)	0,8	0,6	0,2	0,5
Washing machine up to 6 kg	0,8	0,6	0,6	0,5
Washing machine up to 12 kg	1,5	1,2	1,2	1,0
WC with 4,0 l cistern	**	1,8	**	**
WC with 6,0 l cistern	2,0	1,8	1,2 to 1,7***	2,0
WC with 7,5 l cistern	2,0	1,8	1,4 to 1,8***	2,0
WC with 9,0 l cistern	2,5	2,0	1,6 to 2,0***	2,5
Floor gully DN 50	0,8	0,9	-	0,6
Floor gully DN 70	1,5	0,9	-	1,0
Floor gully DN 100	2,0	1,2	-	1,3

* Per person.
** Not permitted.
*** Depending upon type (valid for WC's with siphon flush cistern only).
\- Not used or no data.

	WC	WB	BH	SH	SK	DW+WM	FG
6th floor	2	2					
5th floor	3	3					
4th floor	4	4					
3rd floor	4	4					
2nd floor	4	4					
1st floor	4	4					
Ground floor	3	3					
Basement	2	1	0	3	2	2	1
Total appliances	26	25	0	3	2	2	1
Discharge Units	1.8	0.3	1.3	0.4	1.3	0.8	1

Total Discharge units per appliance	46.8	7.5	1.2	1.2	2.6	1.6	1

Sum of Discharge units	61.9

K	0.5
Q (l/s) Max Foul Flow rate	3.93

$$Q_{ww} = K\sqrt{\Sigma DU}$$

Q_{ww} = Waste water flowrate (l/s)
K = Frequency factor
ΣDU = Sum of discharge units

Table 3 — Typical frequency factors (*K*)

Usage of appliances	*K*
Intermittent use, e.g. in dwelling, guesthouse, office	0,5
Frequent use, e.g. in hospital, school, restaurant, hotel	0,7
Congested use, e.g. in toilets and/or showers open to public	1,0
Special use, e.g. laboratory	1,2

Hydraulic capacity is given by the below table 11 from BS EN 12056-2

Table 11 — Hydraulic capacity (Q_{max}) and nominal diameter (DN)

Stack and stack vent	System I, II, III, IV Q_{max} (l/s)	
DN	Square entries	Swept entries
60	0,5	0,7
70	1,5	2,0
80*	2,0	2,6
90	2,7	3,5
100**	4,0	5,2
125	5,8	7,6
150	9,5	12,4
200	16,0	21,0
* Minimum size where WC's are connected in system II.		
** Minimum size where WC's are connected in system I, III, IV.		

Assuming worst case square entries, a DN 100 pipe is suitable for the primary stack.