

**34-38 Southampton Street
Reading, Berkshire**

Drainage Statement

Project No. W01869



Prepared by:
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Structural
Engineering



Civil
Engineering



CDM
Consultants



Sustainability
and BREEAM



Traffic and
Transport



Flood Risk
Assessments



Highway
Engineering



Event
Engineering

Issue and Amendment Record:

Revision	Comment/Amendment	Prepared	Reviewed	Approved	Date
-	Initial Issue	RDH	HH	RDH	22/6/2018
a	MB - Client amendments	RDH/ASm	RDH	RDH	22/6/2018

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1.0 Introduction

- 1.1** This report has been prepared by Scott White and Hookins LLP to provide information on the proposed drainage strategy for the proposed redevelopment works at 34-38 Southampton Street, Reading.
- 1.2** This report has been prepared in accordance with the NPPF and the accompanying Planning Practice Guidance.
- 1.3** This report is for the private and confidential use of MacNiven Quays and its agents and may not be copied in whole or in part without the written permission of Scott White and Hookins.

2.0 Site Proposals

- 2.1** The site is located close to the centre of Reading.
- 2.2** The site comprises of the former Red Lion Public House, and a residential unit at no. 38.
- 2.3** The proposal is to demolish the existing buildings and redevelop with a new block of residential apartments.

3.0 Drainage Strategy

3.1 Foul Drainage

- 3.1.1 The existing site has drainage connected to the adopted Thames Water drain in Southampton Street.
- 3.1.2 The proposal is to renew all the drainage within the site, and connect to the existing off site connection.
- 3.1.3 An application will be made to Thames Water to confirm the reconfigured layout on site.

3.2 Surface Water Drainage

- 3.2.1 Due to the nature of the ground conditions at the development site being clay based, infiltration into the sub soils is expected not to be possible. Also, proximity of other structures will make formal soakaway structures impossible to locate on site.
- 3.2.2 Therefore considering the hierarchy of discharge:
- Infiltration into ground
 - Discharge to a watercourse
 - Discharge to a sewer
- 3.2.3 As the first and second options are not available at the site, it is proposed that for our development, discharge to the existing adopted drains in Southampton Street is recommended. This mirrors the current site discharge.
- 3.2.4 It is proposed that sustainable drainage solutions will be utilised on site with surface water from the buildings discharging to cellular crate soakaways located in landscaping to the rear of the development. Pathways will be permeable paving to mirror a green space scenario.
- 3.2.5 Calculating the current site discharge rates, based on the 260m² impermeable area with a 60min storm duration, the existing flows are:
- | Return Period | Existing Flow Rate l/s |
|---------------|------------------------|
| 1 in 1 year | 2.3 |
| 1 in 30 year | 5.5 |
| 1 in 100 year | 7.3 |
- 3.2.6 The sustainable drainage solutions have been designed using current Microdrainage software. The design is based on a 1 in 100 year storm event plus 30% allowance for

climate change.

- 3.2.7 Therefore we propose that the following discharge rates will apply based on calculation for each of the return periods and all storm durations for an impermeable area of 225m²:

Return Period	Proposed Flow Rate l/s	Percentage Reduction on Existing Flow
1 in 1 year	1.7	21%
1 in 30 year	2.0	54%
1 in 100 year	2.2	58%

- 3.2.8 Attenuated rates will be achieved by using a Vortex Flow Control Chamber.
- 3.2.9 Based on the above design philosophy, the attenuated storage volume required is 5m³. Please see **Appendix B** for design calculations
- 3.2.10 We have not included for 10% urban creep as the constraints to the site limited the likelihood of any further development.

4.0 Inspection and Maintenance

- 4.1** This section sets out the inspection and maintenance requirements for long term management of the development's surface water drainage system. This work is to be undertaken by a private maintenance company.
- 4.2** All those responsible for maintenance should take appropriate health, safety and welfare precautions for all activities including lone working, if relevant, and risk assessments should always be undertaken. The site's infrastructure Health and Safety File should be consulted before carrying out any works either inside or outside of the development's boundary and information regarding the location of existing utilities passed on to operatives.
- 4.3** The requirements of the Health and Safety at Work Act 1974 and The Construction (Design and Management) Regulations 2015 should be adhered to and any residual risks identified in the Health and Safety File should be managed and information passed on to maintenance operatives through task specific risk assessments.
- 4.4** There are three types of maintenance activities associated with surface water drainage systems. The SuDS Manual, CIRIA C753, defines these as:
- Regular Maintenance – *'basic tasks undertaken on a frequent and predictable schedule' including vegetation management, litter and debris removal, and inspections.'*
 - Occasional Maintenance – *'tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).'*
 - Remedial Maintenance – *'intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.'*

Operation and Maintenance Activity	SuDs Component		
	Piped Network / Inspection Chambers	Cellular / Modular Storage	Permeable Pavement
Regular Maintenance			
Inspection	■	■	■
Litter and debris removal	■	□	■
Grass cutting		□	□
Weed and invasive plant control			□
Occasional Maintenance			
Sediment management	■	■	■
Vacuum sweeping and brushing			■
Remedial Maintenance			
Structure rehabilitation/ repair	□	□	□
Infiltration surface reconditioning			□
■ Will be required □ May be required			
Extract from The SuDs Manual Table 32.1 : Typical key SuDs components operation and maintenance activities			

Piped Network/Chambers Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action	Monthly for three months, then six monthly
	Debris removal from catchment surface / gratings (where may cause risks to performance)	Monthly (and after large storms)
	Remove sediment from trapped sumps, manholes and catchpits.	Annually or as required
Remedial Maintenance	Repair / rehabilitation of gratings, inlets and outlets	As required
Monitoring	Inspect / check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed	Annually and after large storm events
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of features or pipework is required.	As required

Permeable Pavement Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over the whole surface). Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material if present. Any lost material should be replaced.	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers' recommendations – pay particular attention to areas where water runs from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weed or management using glyphosate applied directly to the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements
Remedial Maintenance	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structured performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 year or as required (if infiltration and filtration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and / or weed growth - If required, take remedial action.	Three-monthly, forty-eight hours after large rainfall events in the first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually
The SuDS Manual Table 20.15: Operation and maintenance requirements for pervious pavements		

Cellular Storage Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action	Monthly for three months, then annually.
	Remove debris from catchment surface (where may cause risks to performance)	Monthly
	Remove debris from catchment surface (where may cause risks to performance)	Annually or as required
Remedial Maintenance	Repair / rehabilitate inlets, outlets, overflows and vents	As required
Monitoring	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storm events
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of storage units is required.	As required
The SuDS Manual Table 21.3: Operation and maintenance requirements for attenuation storage tanks		

5.0 Summary

- 5.1.1 The site is an existing brownfield site
- 5.1.2 The drainage scheme proposed, reduces the current peak flow discharge from the site by at least 27%, with a reduced impermeable area of 14%.
- 5.1.3 Attenuated storage of surface water will be provided of 5m³

6.0 Appendices

Appendix A **Calculations**

Microdrainage Calculations:

Existing 1 in 1 Year Storm

Proposed 1 in 100 plus 40% Year Storm

Scott-White & Hookins					Page 1	
42 West Street London House Carshalton SM5 2PR						
Date 22/06/2018 10:51 File lin1 Exist 260m2.SRCX						
Designed by R Hemming Checked by						
Micro Drainage			Source Control 2017.1			
Summary of Results for 1 year Return Period						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
15 min Summer	48.672	0.072	3.7	0.1	O K	
30 min Summer	48.667	0.067	3.1	0.1	O K	
60 min Summer	48.656	0.056	2.3	0.1	O K	
120 min Summer	48.646	0.046	1.5	0.1	O K	
180 min Summer	48.640	0.040	1.2	0.0	O K	
240 min Summer	48.636	0.036	1.0	0.0	O K	
360 min Summer	48.631	0.031	0.7	0.0	O K	
480 min Summer	48.627	0.027	0.6	0.0	O K	
600 min Summer	48.624	0.024	0.5	0.0	O K	
720 min Summer	48.623	0.023	0.4	0.0	O K	
960 min Summer	48.620	0.020	0.4	0.0	O K	
1440 min Summer	48.618	0.018	0.3	0.0	O K	
2160 min Summer	48.616	0.016	0.2	0.0	O K	
2880 min Summer	48.615	0.015	0.2	0.0	O K	
4320 min Summer	48.613	0.013	0.1	0.0	O K	
5760 min Summer	48.611	0.011	0.1	0.0	O K	
7200 min Summer	48.610	0.010	0.1	0.0	O K	
8640 min Summer	48.610	0.010	0.1	0.0	O K	
10080 min Summer	48.609	0.009	0.1	0.0	O K	
15 min Winter	48.672	0.072	3.6	0.1	O K	
30 min Winter	48.662	0.062	2.7	0.1	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
15 min Summer	29.060	0.0	1.4	10		
30 min Summer	18.884	0.0	1.8	17		
60 min Summer	11.942	0.0	2.3	32		
120 min Summer	7.400	0.0	2.9	62		
180 min Summer	5.566	0.0	3.3	92		
240 min Summer	4.542	0.0	3.5	122		
360 min Summer	3.408	0.0	4.0	182		
480 min Summer	2.762	0.0	4.3	240		
600 min Summer	2.346	0.0	4.6	304		
720 min Summer	2.053	0.0	4.8	362		
960 min Summer	1.664	0.0	5.2	480		
1440 min Summer	1.237	0.0	5.8	716		
2160 min Summer	0.921	0.0	6.5	1092		
2880 min Summer	0.747	0.0	7.0	1444		
4320 min Summer	0.555	0.0	7.8	2196		
5760 min Summer	0.450	0.0	8.4	2832		
7200 min Summer	0.382	0.0	9.0	3592		
8640 min Summer	0.335	0.0	9.4	4288		
10080 min Summer	0.299	0.0	9.8	5192		
15 min Winter	29.060	0.0	1.6	10		
30 min Winter	18.884	0.0	2.1	17		
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42 West Street London House Carshalton SM5 2PR					
Date 22/06/2018 10:51 File lin1 Exist 260m2.SRCX		Designed by R Hemming Checked by			
Micro Drainage		Source Control 2017.1			
Summary of Results for 1 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	48.650	0.050	1.8	0.1	O K
120 min Winter	48.639	0.039	1.1	0.0	O K
180 min Winter	48.634	0.034	0.9	0.0	O K
240 min Winter	48.630	0.030	0.7	0.0	O K
360 min Winter	48.625	0.025	0.5	0.0	O K
480 min Winter	48.622	0.022	0.4	0.0	O K
600 min Winter	48.620	0.020	0.4	0.0	O K
720 min Winter	48.619	0.019	0.3	0.0	O K
960 min Winter	48.617	0.017	0.3	0.0	O K
1440 min Winter	48.616	0.016	0.2	0.0	O K
2160 min Winter	48.614	0.014	0.2	0.0	O K
2880 min Winter	48.613	0.013	0.1	0.0	O K
4320 min Winter	48.611	0.011	0.1	0.0	O K
5760 min Winter	48.610	0.010	0.1	0.0	O K
7200 min Winter	48.609	0.009	0.1	0.0	O K
8640 min Winter	48.609	0.009	0.1	0.0	O K
10080 min Winter	48.608	0.008	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	11.942	0.0	2.6	32	
120 min Winter	7.400	0.0	3.2	60	
180 min Winter	5.566	0.0	3.6	92	
240 min Winter	4.542	0.0	4.0	124	
360 min Winter	3.408	0.0	4.5	188	
480 min Winter	2.762	0.0	4.8	248	
600 min Winter	2.346	0.0	5.1	302	
720 min Winter	2.053	0.0	5.4	360	
960 min Winter	1.664	0.0	5.8	488	
1440 min Winter	1.237	0.0	6.5	708	
2160 min Winter	0.921	0.0	7.2	1076	
2880 min Winter	0.747	0.0	7.8	1440	
4320 min Winter	0.555	0.0	8.7	2136	
5760 min Winter	0.450	0.0	9.4	2920	
7200 min Winter	0.382	0.0	10.0	3544	
8640 min Winter	0.335	0.0	10.5	4200	
10080 min Winter	0.299	0.0	11.0	4968	
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Micro Drainage Source Control 2017.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.800	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.026

Time (mins)	Area
From:	To: (ha)
0	4 0.026

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Micro Drainage Source Control 2017.1		
<u>Model Details</u> Storage is Online Cover Level (m) 49.600 <u>Pipe Structure</u> Diameter (m) 0.225 Length (m) 10.000 Slope (1:X) 50.000 Invert Level (m) 48.600 <u>Pipe Outflow Control</u> Diameter (m) 0.225 Entry Loss Coefficient 0.500 Slope (1:X) 50.0 Coefficient of Contraction 0.600 Length (m) 10.000 Upstream Invert Level (m) 48.600 Roughness k (mm) 0.600		
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Date 22/06/2018 10:49 File 1IN100 PLUS 30% 225SQM....							
Designed by R Hemming Checked by							
Micro Drainage		Source Control 2017.1					
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	48.949	0.349	0.0	2.2	2.2	5.0	O K
60 min Winter	48.933	0.333	0.0	2.2	2.2	4.7	O K
120 min Winter	48.860	0.260	0.0	2.1	2.1	3.7	O K
180 min Winter	48.786	0.186	0.0	1.9	1.9	2.6	O K
240 min Winter	48.722	0.122	0.0	1.8	1.8	1.7	O K
360 min Winter	48.632	0.032	0.0	1.6	1.6	0.5	O K
480 min Winter	48.600	0.000	0.0	1.5	1.5	0.0	O K
600 min Winter	48.600	0.000	0.0	1.3	1.3	0.0	O K
720 min Winter	48.600	0.000	0.0	1.1	1.1	0.0	O K
960 min Winter	48.600	0.000	0.0	0.9	0.9	0.0	O K
1440 min Winter	48.600	0.000	0.0	0.6	0.6	0.0	O K
2160 min Winter	48.600	0.000	0.0	0.5	0.5	0.0	O K
2880 min Winter	48.600	0.000	0.0	0.4	0.4	0.0	O K
4320 min Winter	48.600	0.000	0.0	0.3	0.3	0.0	O K
5760 min Winter	48.600	0.000	0.0	0.2	0.2	0.0	O K
7200 min Winter	48.600	0.000	0.0	0.2	0.2	0.0	O K
8640 min Winter	48.600	0.000	0.0	0.1	0.1	0.0	O K
10080 min Winter	48.600	0.000	0.0	0.1	0.1	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	84.848	0.0	8.2	27			
60 min Winter	53.188	0.0	10.3	46			
120 min Winter	32.259	0.0	12.5	82			
180 min Winter	23.779	0.0	13.8	116			
240 min Winter	19.047	0.0	14.7	146			
360 min Winter	13.827	0.0	16.0	204			
480 min Winter	11.024	0.0	17.0	0			
600 min Winter	9.241	0.0	17.9	0			
720 min Winter	7.997	0.0	18.5	0			
960 min Winter	6.361	0.0	19.7	0			
1440 min Winter	4.600	0.0	21.3	0			
2160 min Winter	3.321	0.0	23.1	0			
2880 min Winter	2.633	0.0	24.4	0			
4320 min Winter	1.896	0.0	26.4	0			
5760 min Winter	1.500	0.0	27.8	0			
7200 min Winter	1.251	0.0	29.0	0			
8640 min Winter	1.077	0.0	30.0	0			
10080 min Winter	0.949	0.0	30.8	0			
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Micro Drainage Source Control 2017.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.800	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.023

Time (mins)	Area
From:	To: (ha)
0	4 0.023

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Model Details

Storage is Online Cover Level (m) 49.600

Cellular Storage Structure

Invert Level (m) 48.600 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	15.0	0.0	1.300	15.0	0.0
0.100	15.0	0.0	1.400	15.0	0.0
0.200	15.0	0.0	1.500	15.0	0.0
0.300	15.0	0.0	1.600	15.0	0.0
0.400	15.0	0.0	1.700	15.0	0.0
0.500	15.0	0.0	1.800	15.0	0.0
0.600	15.0	0.0	1.900	15.0	0.0
0.700	15.0	0.0	2.000	15.0	0.0
0.800	15.0	0.0	2.100	15.0	0.0
0.900	15.0	0.0	2.200	15.0	0.0
1.000	15.0	0.0	2.300	15.0	0.0
1.100	15.0	0.0	2.400	15.0	0.0
1.200	15.0	0.0	2.500	15.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0050-2300-0700-2300
Design Head (m)	0.700
Design Flow (l/s)	2.3
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	50
Invert Level (m)	48.300
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	2.3
Flush-Flo™	0.075	0.9
Kick-Flo®	0.075	0.9
Mean Flow over Head Range	-	1.6

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

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Hydro-Brake® Optimum Outflow Control <table><thead><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>0.100</td><td>1.0</td><td>1.200</td><td>2.9</td><td>3.000</td><td>4.5</td><td>7.000</td><td>6.8</td></tr><tr><td>0.200</td><td>1.3</td><td>1.400</td><td>3.2</td><td>3.500</td><td>4.9</td><td>7.500</td><td>7.0</td></tr><tr><td>0.300</td><td>1.6</td><td>1.600</td><td>3.4</td><td>4.000</td><td>5.2</td><td>8.000</td><td>7.2</td></tr><tr><td>0.400</td><td>1.8</td><td>1.800</td><td>3.6</td><td>4.500</td><td>5.5</td><td>8.500</td><td>7.4</td></tr><tr><td>0.500</td><td>2.0</td><td>2.000</td><td>3.7</td><td>5.000</td><td>5.8</td><td>9.000</td><td>7.6</td></tr><tr><td>0.600</td><td>2.1</td><td>2.200</td><td>3.9</td><td>5.500</td><td>6.0</td><td>9.500</td><td>7.9</td></tr><tr><td>0.800</td><td>2.4</td><td>2.400</td><td>4.1</td><td>6.000</td><td>6.3</td><td></td><td></td></tr><tr><td>1.000</td><td>2.7</td><td>2.600</td><td>4.2</td><td>6.500</td><td>6.5</td><td></td><td></td></tr></tbody></table>			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	1.0	1.200	2.9	3.000	4.5	7.000	6.8	0.200	1.3	1.400	3.2	3.500	4.9	7.500	7.0	0.300	1.6	1.600	3.4	4.000	5.2	8.000	7.2	0.400	1.8	1.800	3.6	4.500	5.5	8.500	7.4	0.500	2.0	2.000	3.7	5.000	5.8	9.000	7.6	0.600	2.1	2.200	3.9	5.500	6.0	9.500	7.9	0.800	2.4	2.400	4.1	6.000	6.3			1.000	2.7	2.600	4.2	6.500	6.5		
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