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7 - 9 PICCADILLY, MANCHESTER, M1 1LZ
SURFACE WATER MEANS OF DISPOSAL REPORT

November 2021
Job No. 21518

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Prepared by	Issued
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1.0 INTRODUCTION

1.1 This report has been prepared in connection with the above development and no responsibility is accepted to any third party for all or part of this study in connection with this or any other development.

1.2 The location, size, depth and identification of existing services that may be shown or referred to in this report have been assessed from non-intrusive observations, record drawings and the like. Any Contractor shall safely carry out intrusive investigations, trial holes or soundings, prior to commencing any work, to satisfy himself that it is safe to proceed and that the assessments are accurate. Any discrepancies shall be notified to the Client prior to the commencement of any works.

1.3 This Report has been prepared by Axiom Structures on behalf of its Client, Thackeray Investments (the “Applicant”) to accompany a full planning application for the proposed redevelopment of the property at 7-9 Piccadilly, Manchester City Centre. The development to which this report relates comprises the retention of the commercial unit on the ground floor, with the conversion of the upper floors into high quality Grade A office accommodation, including the sensitive introduction of a third, fourth and fifth floor onto Piccadilly Gardens/Back Piccadilly with a sixth floor set back to provide the opportunity for an attractive roof terrace. In terms of access, the proposals include for a main entrance to the proposed offices from Back Piccadilly.

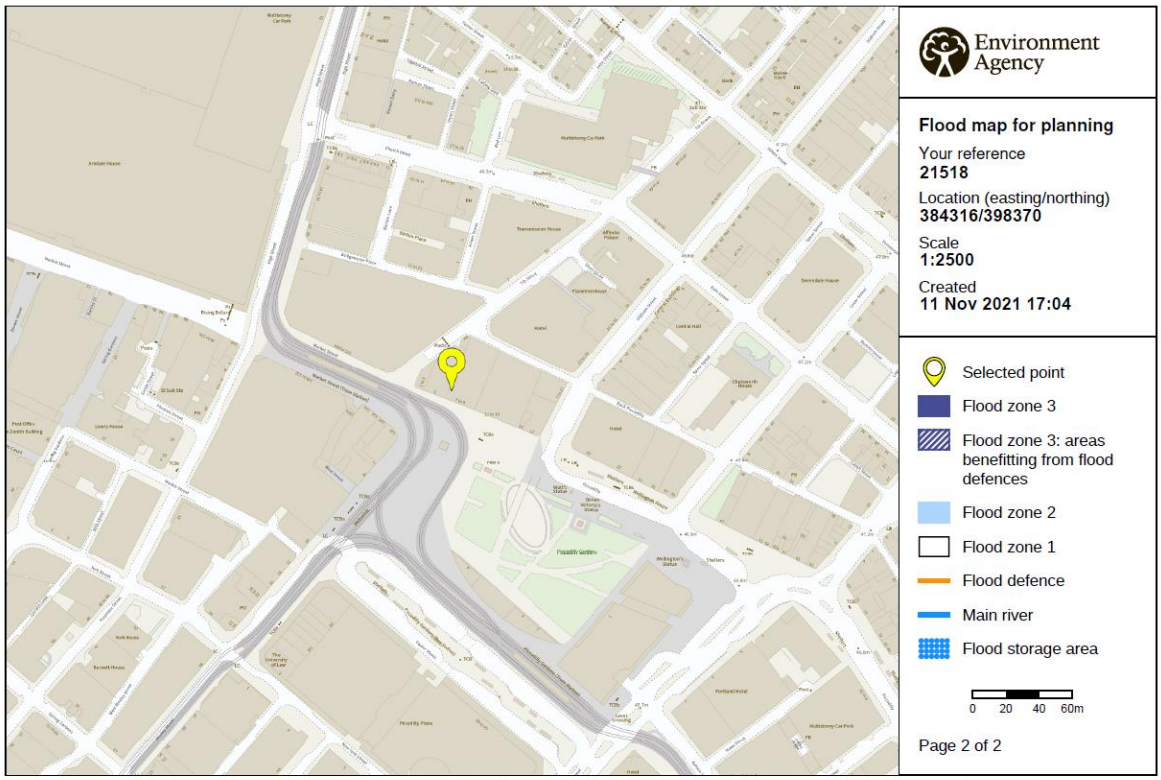
1.4 The Application Site extends to approximately 0.07 hectares and comprises a three-storey building with commercial premises (currently comprising a Superdrug and Greggs store) at ground floor level with storage on the upper floors.

1.5 This report is produced to show how a retrospective SuDS installation can be incorporated into the redevelopment of this property and to demonstrate how the existing volumetric surface water discharge is to be controlled and the storm water attenuated.

2.0 INVESTIGATION

2.1 Flood Risk

The Environment Agency's website supplied the following flood map for planning (see below) which confirms that the site is located in the area classified as FLOOD ZONE 1 an area with a low probability of flooding:-

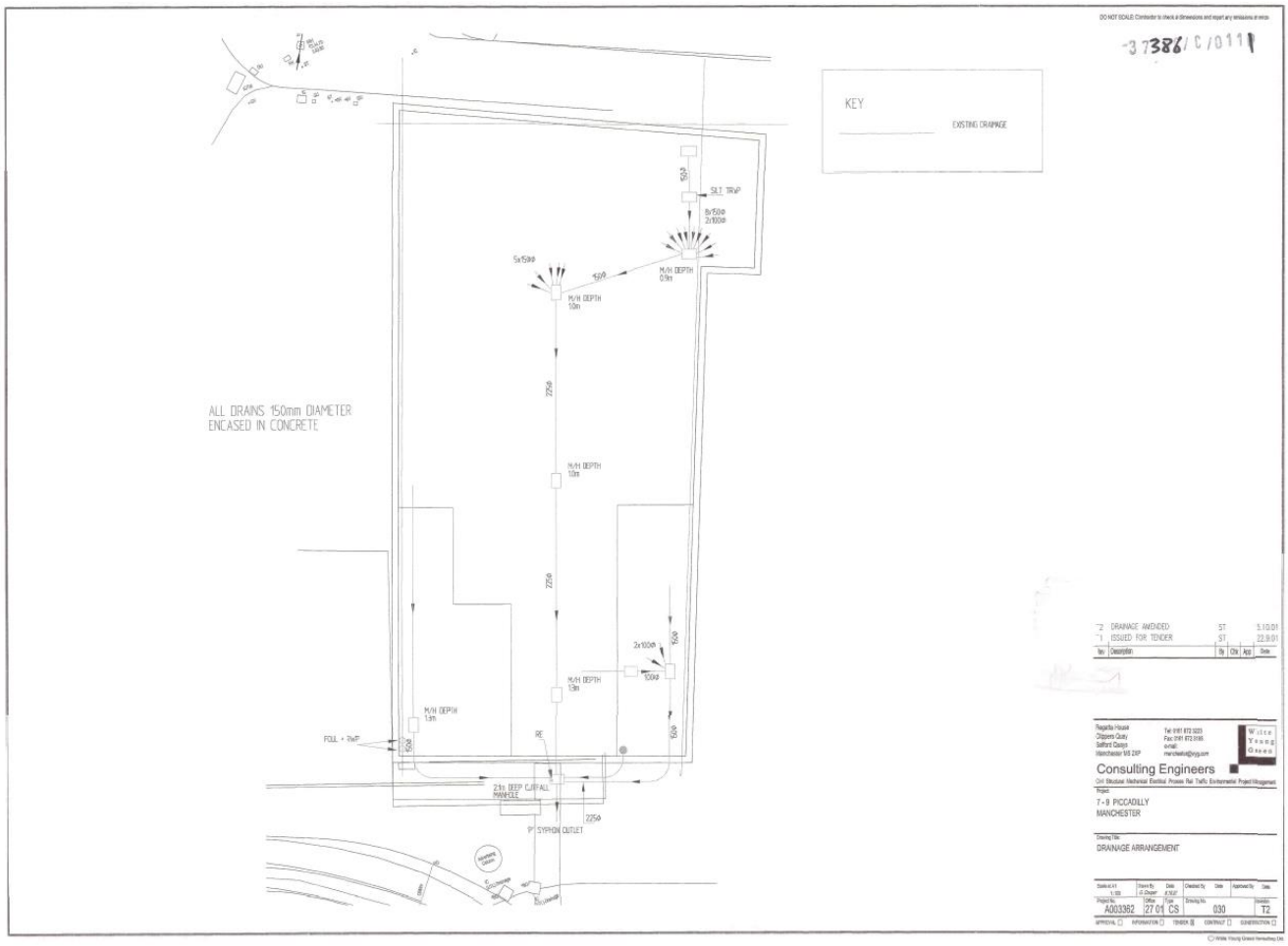


© Environment Agency copyright and / or database rights 2021. All rights reserved. © Crown Copyright and database right 2021. Ordnance Survey licence number 100024198.

2.2 Existing Drainage Survey

White Young Green, Consulting Engineers, carried out a drainage survey of the basement and this was recorded on drawing number A003362 2701 CS 030 T2 dated 15th October 2001, which shows the existing combined drainage within the basement. A copy of this drawing can be seen on the next page.

The drainage routes indicated on this drawing have been reproduced on Axiom's drawing 21518 ASL ZZ ZZ DR D 0600 P1 Existing and Proposed Basement Drainage and can be seen in Section 4.0 Proposed Surface Water Drainage.



2.3 Surface Water Disposal

The surface water drainage system is to be designed in accordance with CIRIA C753 v3 The SuDS Manual. The SuDS system shall accommodate the 1:100 year return period + 40% climate change.

2.4 Surface water disposal should be directed to ground (through infiltration) as the first option; the second option directly to a watercourse (with an agreed restricted discharge) and the third option to sewer (with an agreed restricted discharge).

2.5 The first option to discharge to ground is not viable, because the building will occupy the whole of the site and there is insufficient space to construct a soakaway 5m away from the buildings. Building Regulations – H3 3.25 a - Infiltration Drainage is not Always Possible - states that infiltration devices should not be built within 5m of a building or road, or in an area of unsuitable land. The second option is also not viable, because no watercourse is adjacent to the site boundary. The final option to discharge to sewer is viable, reusing the existing 225Ø combined outfall into the sewer in Piccadilly Gardens.

2.6 Retrofitting SuDS techniques into the existing combined drainage system is not practical. The existing combined drainage within the basement would have to be totally replaced with separate foul and surface water drainage systems. This is because the two existing tenanted retail units within the basement would be severely disrupted. Therefore, the attenuation is to be stored within a blue roof at seventh floor level.

2.7 The surface water is to be attenuated using a blue roof at seventh floor level, with a flow control rainwater outlet orifice size of 45mmØ passing 1.00 litre per second. The fifth floor balconies and the first floor light well are to discharge surface water unrestricted.

2.8 Drainage Roof Areas

The following calculations use BSEN 12056 Drainage Inside Buildings Figure NB.1 - Rainfall intensity, for a 2 minute duration storm event with a return period of 1 year.

Application Site Area 700m^2

Existing surface water runoff		= 12.6 litres per second
Unrestricted Roofs		
Ground floor light well area 30m^2	= 0.54 litres per second	
2No. Balcony areas 175m^2	= 3.15 litres per second	
Restricted Roof with a controlled discharge		
Blue roof area 323m^2	= 1.00 litre per second	
Total runoff from proposed roofs		= 4.69 litres per second
Subtract existing runoff from proposed		**=7.91 litres per second Achieving a reduction of 63% in volumetric discharge**

2.9 Greenfield Runoff

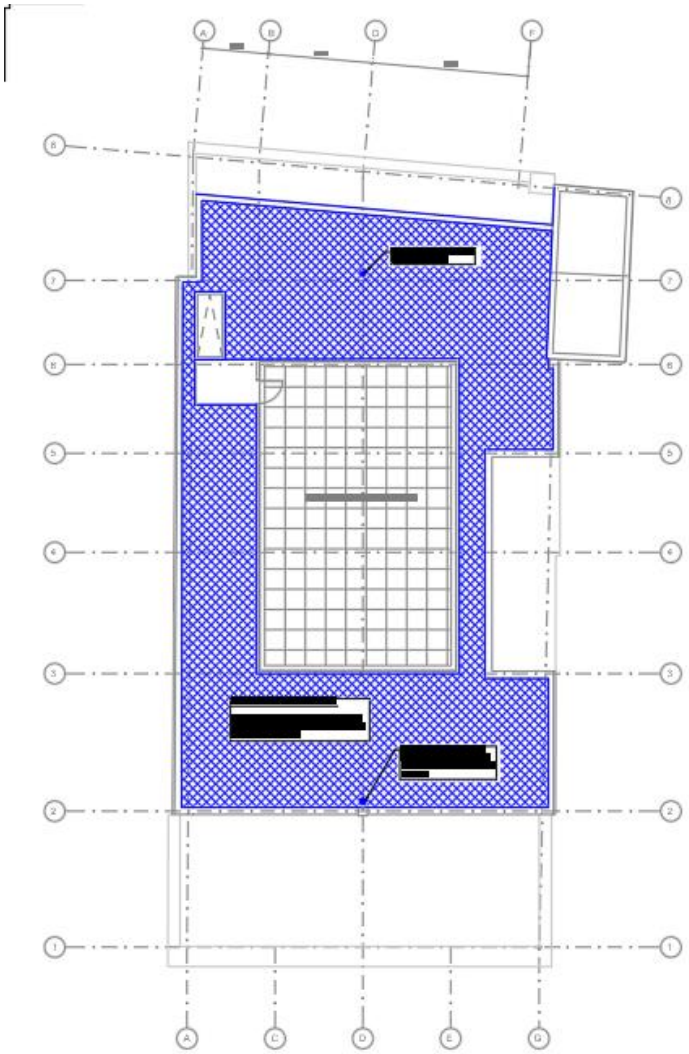
MicroDrainage source control 2020.1.3 software was used to calculate the QBAR (the (arithmetic) mean annual maximum flood) flow rate in litres per second for the area of greenfield site to be occupied by the proposed development of 700m^2 (0.07 hectares).

2.10 The MicroDrainage greenfield calculations in Section 3.0 Calculations, show that QBAR Q100 years is 0.08 litres per second.

2.11 The SuDS C753 v3 Manual recommends in Chapter 3, page 44 – 3.3.1 Water Quantity Standard 1: Control of Runoff Volume b) Volume Control For Extreme Rainfall Events - Item number 2: All the runoff from the site for the 1:100 year event should be discharged at either a rate of 2 litres per second per Hectare (ha) or the average annual peak flow rate (ie the mean annual flood QBAR) whichever is the greater. Therefore, 2 litres per ha x 0.07 hectares = 0.14 litres per second and is to be considered.

2.12 A volumetric restriction of 0.14 litres per second would require a very small orifice, which is likely to block within a blue roof installation. Therefore, the restricted discharge is increased to 1.00 litre per second, with an orifice size of 45mmØ to mitigate this risk.

2.13 The following drawing 21518 ASL ZZ ZZ DR D 0602 P3 Proposed Blue Roof shows that the upper flat roof is 490m^2 however, the screened plant enclosure cannot be used to store attenuated rainwater and is to be bunded from the surrounding roof, which has a floodable surface area of 323m^2. A .pdf copy of this drawing is appended to this report:-



2.14 Attenuation Volume

MicroDrainage source control 2020.1.3 software was used to calculate the storage volume required to accommodate the 1:100 year period + 40% climate change, without the blue roof overflowing.

2.15 The calculations show that the required attenuation storage is 24.7m^3, peaking at 360 minutes during a winter storm.

2.16 This volume equates to an attenuation blue roof size of 323m^2, with a water depth of 77mm.

2.17 The flow control is a rainwater outlet, with a 45mmØ orifice and an emergency overflow, set at 80mm above the roof.

2.18 The MicroDrainage calculations supporting the above statements are contained within Section 3.0 Calculations, of this report.

3.0 CALCULATIONS

Greenfield Runoff calculation page 1 of 1

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		Page 1
	Piccadilly Blue Roof Greenfield Runoff	Micro Drainage
Date 11/11/2021 19:27 File 211111 Piccadilly Green...	Designed by jdh Checked by	
Micro Drainage	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.070	Urban	0.000
SAAR (mm)	868	Region Number	Region 10

Results	l/s
QBAR Rural	0.4
QBAR Urban	0.4
Q100 years	0.8
Q1 year	0.3
Q30 years	0.7
Q100 years	0.8

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Summary Results for 100 year return period (+ 40%) page 1 of 5

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		Page 1
	Piccadilly Blue Roof Excluding Plant Area	Micro Drainage
Date 02/11/2021 14:27 File 211102 Piccadilly Blue ...	Designed by jdh Checked by	
Micro Drainage	Source Control 2020.1.3	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.033	0.033	0.3	10.7	O K
30 min Summer	100.044	0.044	0.5	14.1	O K
60 min Summer	100.054	0.054	0.7	17.4	O K
120 min Summer	100.063	0.063	0.8	20.2	O K
180 min Summer	100.066	0.066	0.9	21.2	O K
240 min Summer	100.067	0.067	0.9	21.7	O K
360 min Summer	100.069	0.069	0.9	22.2	O K
480 min Summer	100.070	0.070	0.9	22.4	O K
600 min Summer	100.070	0.070	0.9	22.5	O K
720 min Summer	100.069	0.069	0.9	22.4	O K
960 min Summer	100.068	0.068	0.9	21.9	O K
1440 min Summer	100.064	0.064	0.9	20.7	O K
2160 min Summer	100.059	0.059	0.8	19.1	O K
2880 min Summer	100.055	0.055	0.7	17.7	O K
4320 min Summer	100.049	0.049	0.6	15.7	O K
5760 min Summer	100.044	0.044	0.5	14.2	O K
7200 min Summer	100.041	0.041	0.4	13.1	O K
8640 min Summer	100.038	0.038	0.4	12.2	O K
10080 min Summer	100.035	0.035	0.3	11.3	O K
15 min Winter	100.037	0.037	0.4	12.0	O K
30 min Winter	100.049	0.049	0.6	15.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.728	0.0	8.1	26
30 min Summer	79.453	0.0	11.5	40
60 min Summer	50.812	0.0	16.9	68
120 min Summer	31.453	0.0	21.3	122
180 min Summer	23.449	0.0	24.0	170
240 min Summer	18.923	0.0	25.9	198
360 min Summer	13.867	0.0	28.6	260
480 min Summer	11.129	0.0	30.6	328
600 min Summer	9.376	0.0	32.3	396
720 min Summer	8.146	0.0	33.7	464
960 min Summer	6.520	0.0	35.9	598
1440 min Summer	4.755	0.0	39.1	856
2160 min Summer	3.461	0.0	44.6	1236
2880 min Summer	2.760	0.0	47.3	1616
4320 min Summer	2.002	0.0	50.8	2340
5760 min Summer	1.592	0.0	55.4	3104
7200 min Summer	1.332	0.0	57.9	3824
8640 min Summer	1.151	0.0	59.8	4576
10080 min Summer	1.017	0.0	61.0	5336
15 min Winter	118.728	0.0	9.3	26
30 min Winter	79.453	0.0	13.1	39

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Summary Results for 100 year return period (+ 40%) page 2 of 5

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		Page 2
	Piccadilly Blue Roof Excluding Plant Area	Micro Drainage
Date 02/11/2021 14:27 File 211102 Piccadilly Blue ...	Designed by jdh Checked by	
Micro Drainage	Source Control 2020.1.3	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	100.060	0.060	0.8	19.5	O K
120 min Winter	100.070	0.070	0.9	22.7	O K
180 min Winter	100.074	0.074	1.0	23.9	O K
240 min Winter	100.075	0.075	1.0	24.4	O K
360 min Winter	100.077	0.077	1.0	24.7	O K
480 min Winter	100.076	0.076	1.0	24.7	O K
600 min Winter	100.076	0.076	1.0	24.4	O K
720 min Winter	100.074	0.074	1.0	24.0	O K
960 min Winter	100.071	0.071	0.9	23.0	O K
1440 min Winter	100.065	0.065	0.9	21.0	O K
2160 min Winter	100.058	0.058	0.7	18.7	O K
2880 min Winter	100.052	0.052	0.6	16.9	O K
4320 min Winter	100.045	0.045	0.5	14.5	O K
5760 min Winter	100.040	0.040	0.4	12.9	O K
7200 min Winter	100.036	0.036	0.4	11.7	O K
8640 min Winter	100.033	0.033	0.3	10.7	O K
10080 min Winter	100.031	0.031	0.3	9.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	19.1	66
120 min Winter	31.453	0.0	24.0	132
180 min Winter	23.489	0.0	27.0	176
240 min Winter	18.923	0.0	29.2	208
360 min Winter	13.867	0.0	32.2	276
480 min Winter	11.189	0.0	34.5	352
600 min Winter	9.376	0.0	36.4	416
720 min Winter	8.146	0.0	38.0	500
960 min Winter	6.528	0.0	40.5	618
1440 min Winter	4.755	0.0	44.1	902
2160 min Winter	3.461	0.0	50.1	1288
2880 min Winter	2.760	0.0	53.1	1676
4320 min Winter	2.092	0.0	57.1	2424
5760 min Winter	1.583	0.0	62.2	3176
7200 min Winter	1.332	0.0	64.9	3904
8640 min Winter	1.161	0.0	67.1	4664
10080 min Winter	1.017	0.0	68.8	5352

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Summary Results for 100 year return period (+ 40%) page 3 of 5

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Date 02/11/2021 14:27 File 211102 Piccadilly Blue ...	Designed by jdh Checked by	Micro Drainage
Micro Drainage	Source Control 2020.1.3	

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.361	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.049

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.016	4	8	0.016	8	12	0.016

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Summary Results for 100 year return period (+ 40%) page 4 of 5

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	Piccadilly Blue Roof Excluding Plant Area	Page 4
Date 02/11/2021 14:27 File 211102 Piccadilly Blue ...	Designed by jdh Checked by	Micro Drainage
Micro Drainage	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 101.000

Tank or Pond Structure

Invert Level (m) 100.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	323.0	0.150	323.0	0.151	0.0

Orifice Outflow Control

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 100.000

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Summary Results for 100 year return period (+ 40%) page 5 of 5

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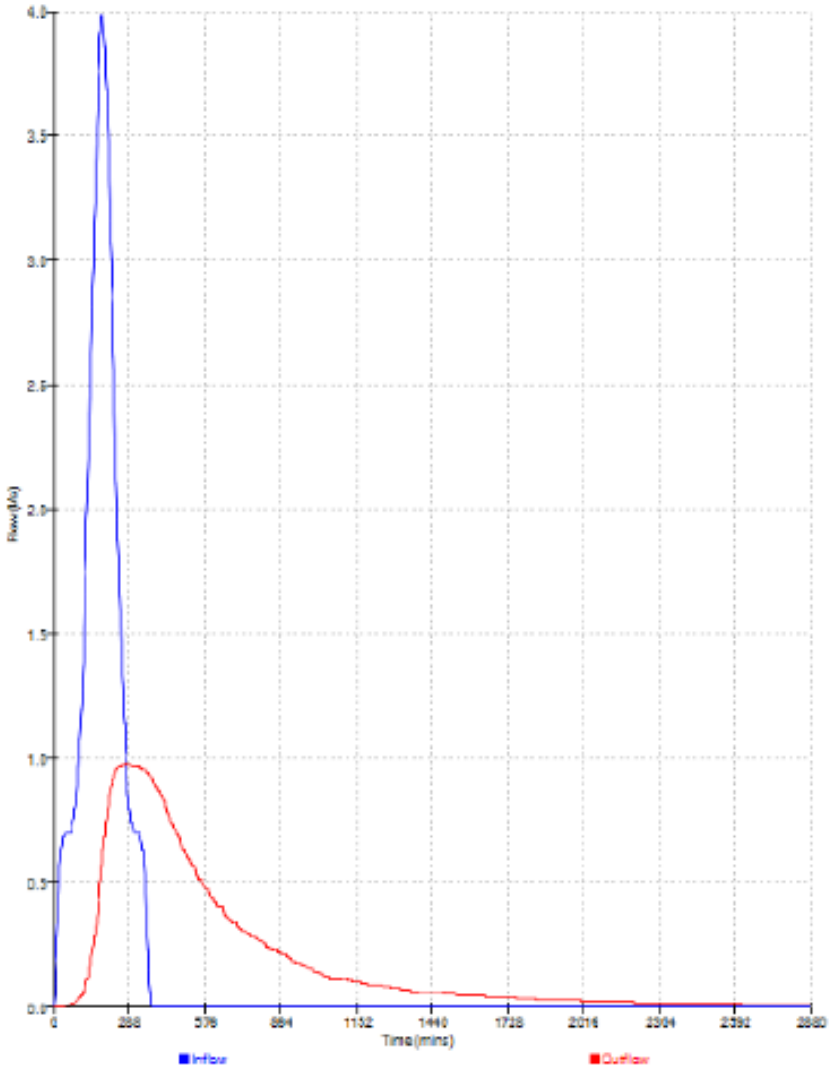
	Piccadilly Blue Roof Excluding Plant Area	Page 5
Date 02/11/2021 14:27 File 211102 Piccadilly Blue ...	Designed by jdh Checked by	Micro Drainage
Micro Drainage	Source Control 2020.1.3	

Event: 360 min Winter



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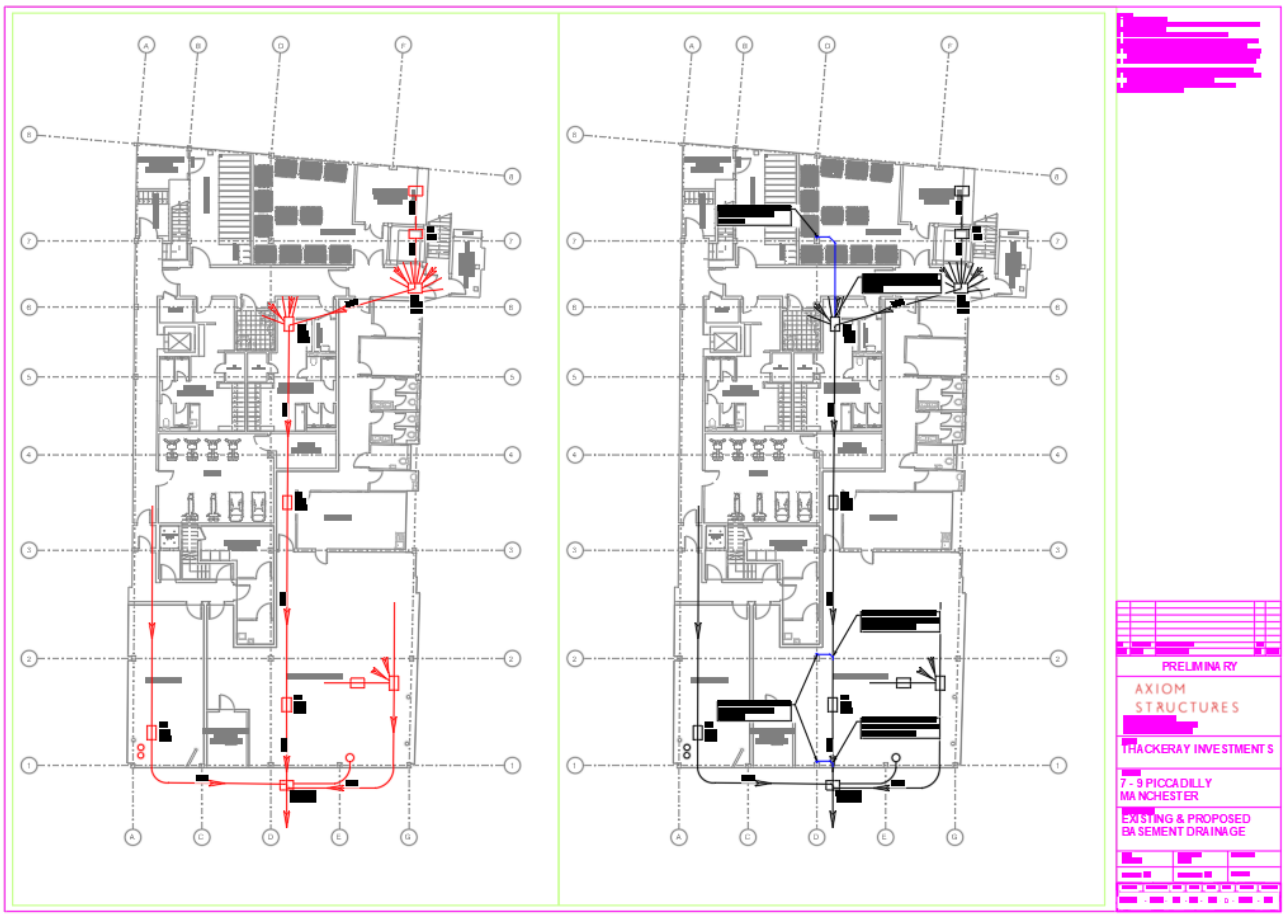
4.0 PROPOSED SURFACE WATER DRAINAGE



The drawing above – 21518 ASL ZZ ZZ DR D 0600 P1 Existing and Proposed Basement Drainage is appended to this report.

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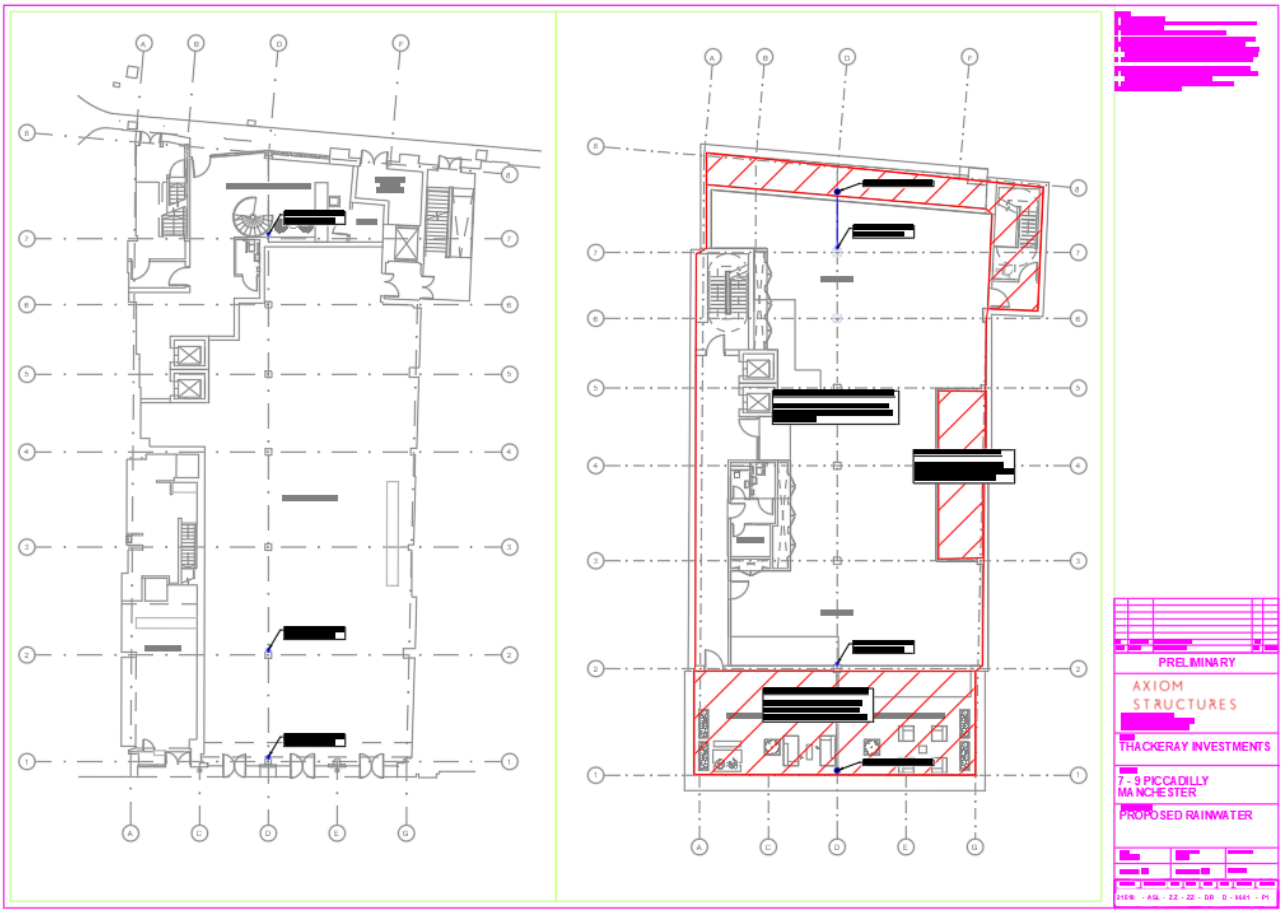
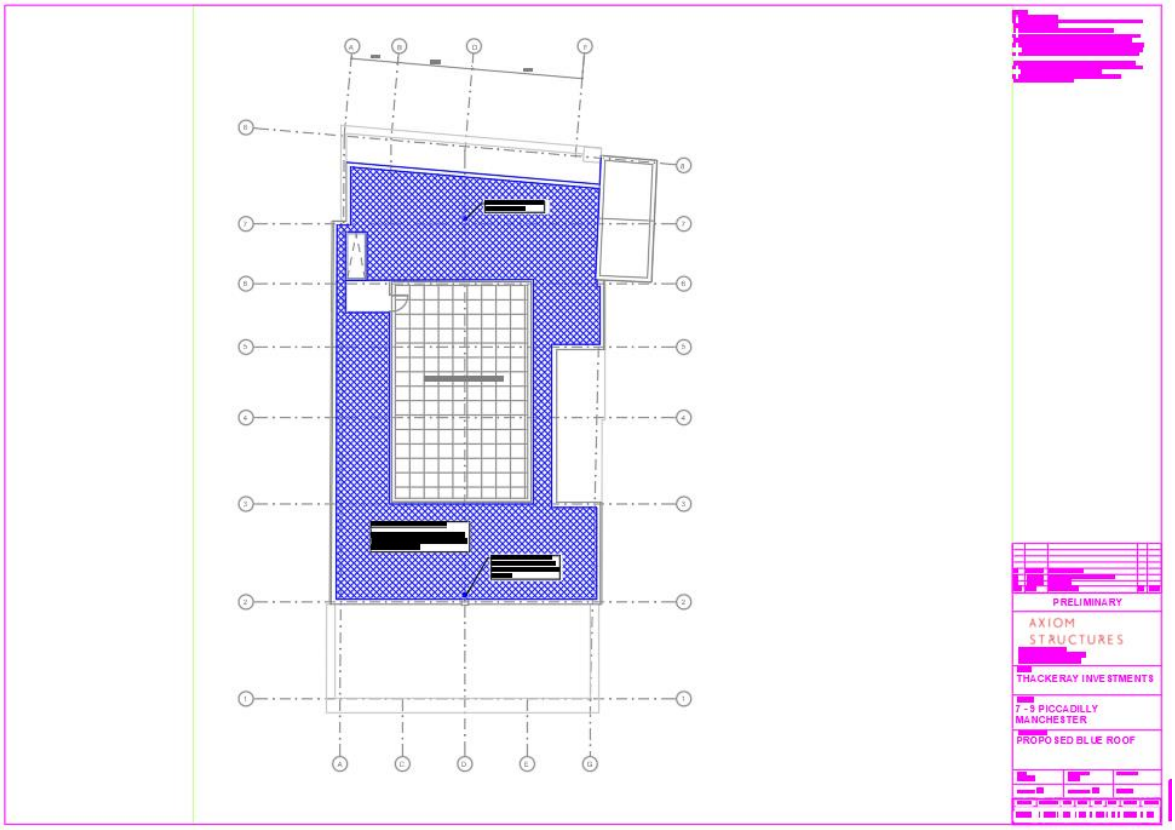


The drawing above – 21518 ASL ZZ ZZ DR D 0601 P1 Proposed Rainwater is appended to this report.



The drawing above – 21518 ASL ZZ ZZ DR D 0602 P3 Proposed Blue Roof is appended to this report.

5.0 OPERATION AND MAINTENANCE REQUIREMENTS FOR THE SuDS INSTALLATION

5.1 The Management of all maintenance for the building, is to be carried out by the Management Company, who are to maintain and repair all common areas to the development. The works to be undertaken include drain cleaning, gully/leaf guard maintenance and gutter cleaning, landscape garden maintenance, external repairs, repairs to internal common parts and window cleaning. The Management Company will arrange all regulatory inspections and tests.

SuDS Maintenance Schedule for:-

7 - 9 PICCADILLY, MANCHESTER, M1 1LZ

Maintenance Schedule	Description	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. Remove debris from the catchment surfaces ie: keep roofs, balconies, rainwater outlets and emergency overflows free from debris, such as rubbish, leaf mulch, nesting materials/dead birds etc.	Monthly for the first 3 months, then annually.
	Remove sediment from around and within rainwater outlets	Annually, or as required.
	Repair, rehabilitate rainwater outlets, emergency overflows and flow control outlet.	As required.
Remedial action	Inspect/check rainwater outlets, emergency overflows and flow control outlet, to ensure that they are in good condition and operating as designed.	Annually.
Monitoring	In the event of emergency overflows operating, inspect flow control orifice for blockage.	Following emergency overflow discharge.

6.0 SUMMARY

6.1 The site is located within FLOOD ZONE 1 an area with a low probability of flooding.

6.2 Retrofitting SuDS into the existing combined drainage system is not practical. Therefore, the attenuation is to be stored within a blue roof at seventh floor level.

6.3 The surface water system is designed in accordance with CIRIA C753 v3 The SuDS Manual. The SuDS system shall accommodate the 1:100 year return period + 40% climate change.

6.4 The above calculations demonstrate that 24.7m^3 of storm water storage is required when the surface water runoff is restricted to 1.00 litre per second. This storage is contained within a blue roof at seventh floor level, with a water depth of 80mm.

6.5 The introduction of a blue roof into the development, results in a 63% reduction in surface water discharge from the brownfield site, thereby reducing the risk of flooding within the local area.