Project:	**Jamestown Road, Camden**	Job No.:	**10391371**
Subject:	**Technical Note to address Flood Risks comments raised during planning consultation**		
Applicant:	**Regal**		
Prepared by:	**SM**	Date:	**21.01.25**

Introduction

The purpose of this Technical Note is to demonstrate that consideration and / or justification that the drainage strategy for the development at Jamestown Road, Camden not only is a sustainable, robust solution but also that it follows The London Plan's drainage hierarchy.

This technical note should be read in conjunction with the HDR Flood Risk and Drainage Strategy document Ref: 10391371-HDR-XX-XX-RP-C-10-0001issued with the planning application submission.

Overview

The site is located 33-35 Jamestown Road London NW1 7DB and 211 Arlington Road London NW1 7HD and has a total area of 0.27ha. The site can be accessed on the east side from Arlington Road.

The proposed redevelopment comprises the demolition of existing buildings and structures to facilitate the creation of a new building comprising basement, ground plus six storey building for a mix of Purpose Built Student Accommodation (Sui Generis), flexible commercial (Class E) and ground plus five Residential (Class C3) uses with ancillary plant, courtyards, access, hard and soft landscaping, cycle parking, highway works and all other works associated with the development.

The proposed site plan is included in Appendix A.

Notes/ Design Assumptions

We have set out this technical note specifically to address the individual points raised during the consultation in the same order they were presented for ease of tracking. Below each point is replicated in *italics* before being addressed by HDR immediately below each point.

1. *Show that rainwater harvesting/blue roofs have been considered within the SuDS design, or justifies their exclusion.*

   Blue Roofs have not been included in the submitted design due to the extensive plant requirements (inc. solar panels, etc.) on the roofs, which cover the majority of the roof extents. Extensive green roofs as described in page 140 of the submitted Design and Access Statement. As advised by the architect and M&E consultation, the inclusion of Blue roofs would impact;
   - Proposed roof build-up depth, which would increase (subsequently increasing the height of the buildings)
   - Structure, loading implications for the structure of the building
   - MEP strategy and coordination of plant rooms.

2. *Provide details of the green roof with its minimum 150mm substrate for storage.*

   A typical detail for the green roof in included on the drainage strategy drawing in Appendix B. However it is not the intention of the green roof to store any volume of surface water run off, more to slow the flows from entering the wider network, apart from the natural absorption of rainwater and therefore reduction of stormwater runoff. That being said, the green roof will provide increased storm water mitigation, water quality improvement, and biodiversity benefits amongst other things.

3. *Show that there have been further groundwater investigations undertaken to understand the risk at the site to the proposed tank and basement, with mitigation measures proposed if necessary.*

   The current site investigation report by Soiltechnics encountered groundwater in one borehole only, that is considered likely to be perched water within the made ground that has seeped in to the borehole. At the time of construction, specific tests will be carried out at strategic locations and depths to inform in further groundwater mitigation is required.

4. *Provide the existing runoff rates.*

   Using the Lloyd Davies Modified Rational method, Q=A x R x 2.78, where A = area in hectares, Ris the rate of rainfall, in this case 50mm/hr and 2.78 being the rainfall coefficient, the existing run off could be considered as;

   Q= 0.27 x 50 x 2.78 = 37.53 l/sec peak run off rate.

   This summarises the current pre development peak run off rate on the basis the site is a brownfield unrestricted site.

   As a sense check, the greenfield calculation reproduced in Appendix C summarises the QBAR rate as being 1.18l/sec, with our proposal to limit the discharge to 2.0l/sec to minimise the potential for blockages in the flow control device, we have demonstrated a significant betterment to the existing condition.

5. *Demonstrate the calculations showing the greenfield, existing and proposed runoff rates.*

   Please refer to the response to point 4.

6. *Provide the greenfield, existing and proposed runoff volumes for the 1 in 100-year 6-hour storm.*

   Please refer to Appendix D for the requested calculations.

7. *Demonstrate within calculations that the application conforms to Defra's Non-Statutory Standards for SuDS.*

   The proposal for this site, is to discharge surface water run off generated as a result of this development in to the existing public combined water network adjacent to the site. The guidance within the Defra documents states the peak flow and volume in to the receiving body should not exceed the greenfield development.
   This development will limit the flows to as near greenfield as reasonably practicable, and attenuating the volumes with no flooding occurring on site for all storms up to and including the 1:100 year event on site, thereby ensuring this criteria is met.

   All components will be designed in accordance with the regulatory body requirements to ensure the structural integrity is appropriate for the design life of the development with the connection to the sewer to be made without effecting the function or integrity of any existing structure.

8. *Demonstrate in a drawing the on and off-site overland exceedance flows.*

   Exceedance flow routes have been added to the drainage strategy drawing reproduced in Appendix B.

9. *Provide the maintenance tasks and frequencies for all drainage components proposed, including a maintenance owner.*

   Regal are the maintenance owner with the following requirements forming part of the official Operation and Maintenance Manual for this development for each sustainable feature on this scheme.

   Storage Tank

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, the annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, 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

Maintenance schedule	Required action	Typical frequency
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Green Roof

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (i.e. year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting as required- clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

10. *Show that the management of Health and Safety risks related to the SuDS design has been considered.*

Best practice design for SuDS should go hand in hand with health and safety risk consideration. Designs should be carried out so that risks are reduced to acceptable levels. The items listed below form the standard design best practices set out in the SuDS Manual.

Drowning:
There are no features that have access to water, other than those professionals tasked with carrying out specific maintenance tasks for which they would be suitably trained in the health and safety aspects incumbent on the body carrying out such tasks. Therefore it can be considered the risk of drowning as a result of this design is minimal.

Slips/Falls:
This design will not increase the risk of slips, trips or falls as a result of the SuDS and drainage components installation or operation and maintenance. There are no additional hazards as part of this design.

Ill health from untreated/polluted water:
There are no components within the proposed design that increase the risk from untreated or standing water. The green roofs provide a treatment source and the finished levels and other drainage components will direct run off away from the proposed properties to gullies and channels that will keep the run off underground.

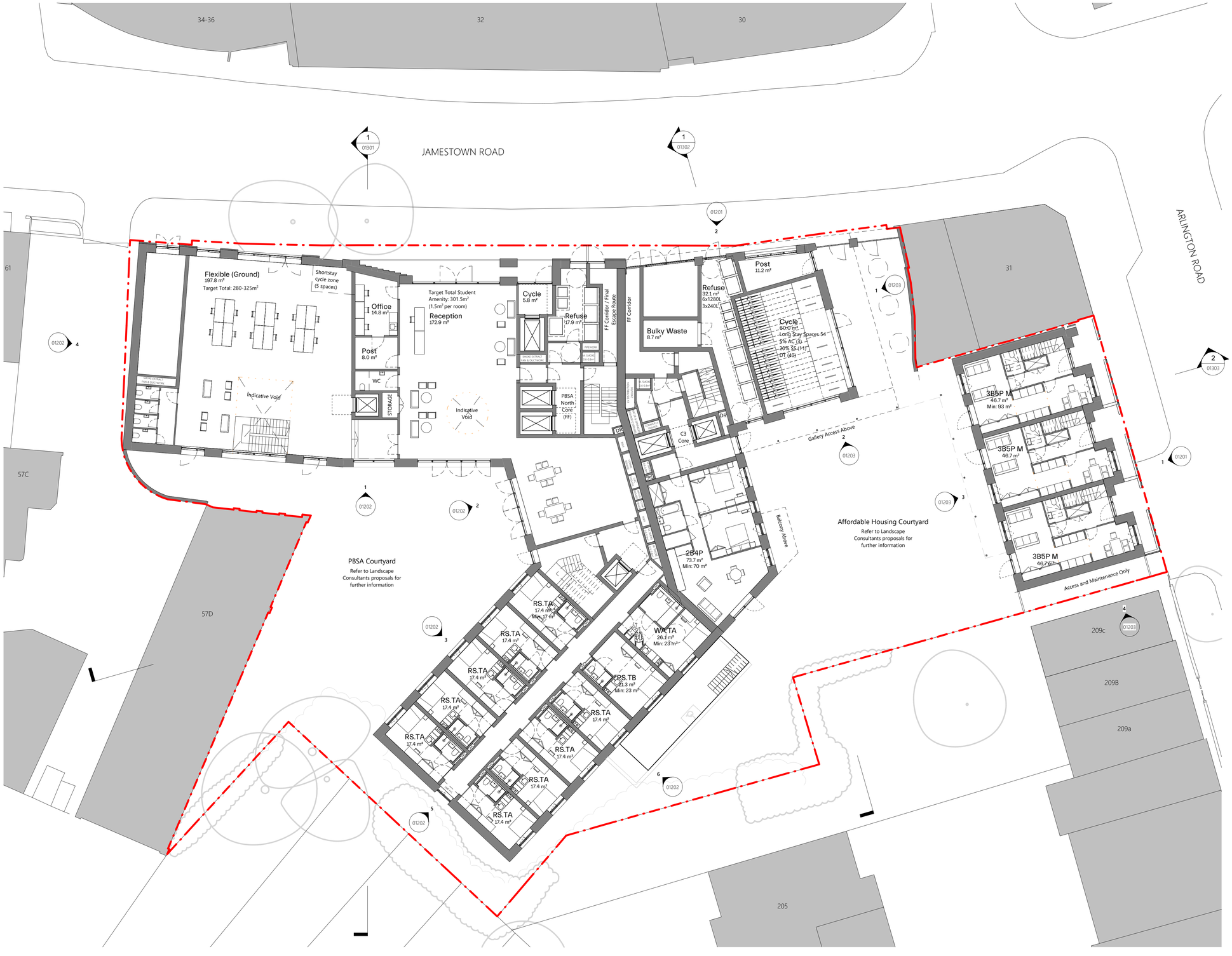
11. *Demonstrate that the development has been designed to resist flooding and cope with the risk of being flooded, with proposed mitigation measures.*

As mentioned previously within this technical note, the proposed drainage strategy has measures to slow down flows entering the network, restricting the flows off site in to the existing sewer network to as near to greenfield as reasonably practicable and attenuating the surface water run off volumes generated as a result of this development, therefore providing a significant betterment from the existing situation, not only ensuring flood risk is not increased as a result of this development, but improving the offsite flood risk through the measures implemented on site.

12. *Provide a Flood Risk Emergency Plan.*

The National Planning Policy Framework states a Flood Risk Emergency Plan (FREP) is required for planning applications for developments in flood zones 2 and 3. This proposed development is located in Flood Zone 1, and with the methods of mitigation mentioned within this technical note it is considered the risk of flooding is low and hence a FREP is not required for this planning application.

Appendix A



2 | PROPOSED PLN LEVEL 00

06110 | 1 : 150

NOTES:

SUPPLEMENTARY INFORMATION:
These drawings reflect the current position of the scheme development at RIBA Stage 2. They should be read in conjunction with the following information prepared by Morris+Company (MCO):
33-35 Jamestown Road Design and Access Statement
23054-MCO-XX-XX-DS-A-02017

These drawings should also be read in conjunction with the following information, prepared by other consultants:
- Structures Reports and Information (HDR Inc.)
- MEP Reports and Information (Wallace Whittle)
- Fire Report (Jensen Hughes)
- Acoustic Report (RBA Acoustics)
- Waste and Transport Report (Iceni)
- Energy Report (Wallace Whittle)
- Enviromental and Sustainability Consultant (Wallace Whittle)
- Landscape Drawings and Specification (New Practice and Context Office)

EXTENTS AND BOUNDARIES:

These drawings combine survey and site information produced by others and as such should be verified for accuracy.

Existing site information, context, surrounding infrastructure, neighbouring building extents and plots are derived from 2D Surveys, produced by:

'Maltby Land Surveys Ltd'
Survey Date: 13.02.2024
Survey Reference: 22249-100-RevA

Room Key

PBSA
01 - Typical Studio
02 - Premium Studio
03 - WCA Studio
04 - Accessible WC
05 - Private Study
06 - Lounge / Games
07 - Cinema
08 - Laundry
09 - Gym
10 - Private Dining / Kitchen
11 - Reception
12 - Post
13 - Management Office
14 - Storage
15 - LV Room
16 - Comms
17 - Cleaners Cupboard
18 - Commercial Sprinkler
19 - Cold Water Storage
20 - Generator
21 - Life Safety Switchroom
22 - Substation
23 - Cycle Store
24 - Refuse

C3
30 - 2B3P Unit
31 - 2B4P Unit
32 - 2B3P WCA Unit
33 - 3B4P Unit
34 - 3B5P Unit
35 - 3B5P Maisonette
36 - Post
37 - LV Room
38 - Comms
39 - Domestic Sprinkler
40 - Cycle Store
41 - Refuse
42 - Bulky Waste

Flexible Workspace
50 - Flexible Workspace
51 - Accessible WC/Shower
52 - Bathrooms

NOTES
All workspace furniture layouts are indicative only
All unit layouts are indicative only
Cycle store layouts are indicative only

revision	date	description
P01	--/--/2024	Planning Submission

0 1500 3000 7500 15000 mm

MORRIS+COMPANY
215 Mare Street - London E8 3QE
+44 (0)20 7566 7440
www.morrisand.company

- Do not scale from this drawing
- All dimensions to be checked on site by the Contractor
- And such dimensions to be their responsibility
- Report all drawing errors and omissions to the Architect
- All dimensions in millimeters unless noted otherwise
- If in doubt ask Contract Administrator

DRAFT

job title	33-35 JAMESTOWN ROAD
drawing title / location	PROPOSED PLAN LEVEL 00
status	S3 - FOR REVIEW AND COMMENT
scale	1 : 150 @ A1

project	originator	funct.	spatial	form	disc.	number
23054	MCO	XX	00	DR	A	06110

Appendix B

NORTH

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE CDM RISK REGISTER

HEALTH:
1) DEMOLITION AND/OR REMOVAL OF THE EXISTING DRAINAGE SYSTEM.
2) EXISTING SERVICES WITHIN THE SITE BOUNDARY.
3) BUILDABILITY OF GRAVITY CONNECTION TO THAMES WATER COMBINED SEWER.
4) LOCATION AND DEPTH OF THAMES WATER SEWER.

SAFETY:
1) UNKNOWN CAPACITY WITHIN THAMES COMBINED WATER SEWER.
2) EXCAVATIONS FOR DRAINAGE MAY BE DEEP. CONTRACTOR TO MANAGE THIS ON SITE.

ENVIRONMENT:
1) PRESENCE OF GROUNDWATER.

NOTES:
1. DRAINAGE STRATEGY BASED ON A GREENFIELD DISCHARGE RATE OF 2.0 l/s.
2. FOUL WATER FLOW RATES BASED ON AN AVERAGE OF 10.3 l/s. TO BE CONFIRMED BY THE MEP DESIGNER.
3. FFL's TO BE CONFIRMED AT THE NEXT DESIGN STAGE.
4. EXISTING DRAINAGE TO BE ABANDONED AND REMOVED PRIOR TO CONSTRUCTION.
5. CONTRACTOR TO IDENTIFY ALL THIRD PARTY RUNS THROUGH THE SITE.
6. SEWER CAPACITY TO BE CONFIRMED BY THAMES WATER.

NEW MANHOLE CONNECTION INTO THE EXISTING THAMES WATER COMBINED SEWER. INVERT LEVEL TO BE CONFIRMED BY CCTV SURVEY. SUBJECT TO S106 APPROVAL.

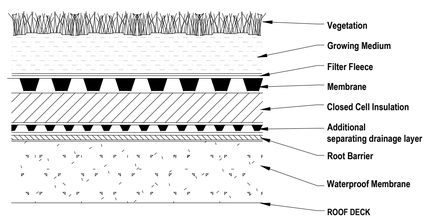
1245x711
1194x762
1194x737
1194x695
30.250

HYDRO-BRAKE MANHOLE DISCHARGE RATE: 2.0 l/s

CWMH01 CL:29.200 IL:26.041
BD IL 27.541
S1.002 Ø150mm L=3.4m @ 1:81
SWMH03 CL:29.000 IL:27.607
F1.001 Ø150mm L=4.3m @ 1:10
FWMH02 CL:29.000 IL:26.467
FWMH01 CL:29.000 IL:27.776
F1.000 Ø150mm L=3.9m @ 1:80
BD IL 27.727
SWMH01 CL:29.590 IL:27.607
FOUL WATER CONNECTION FROM BASEMENT LEVEL
F3.000 Ø150mm L=3.5m @ 1:80
FWMH03 CL:29.000 IL:26.616
F2.001 Ø150mm L=11.9m @ 1:80
S1.005 Ø225mm L=9.1m @ 1:150
S1.004 Ø225mm L=25.5m @ 1:150
Ø300mm HydroStop
Ø300mm HydroStop
SWMH02 CL:29.590 IL:27.607
F2.000 Ø150mm L=10.0m @ 1:80
FWMH04 CL:29.590 IL:26.867
S1.006 Ø225mm L=23.2m @ 1:200
F3.000 Ø150mm L=7.5m @ 1:80
SWMH04 CL:29.590 IL:27.728
S1.004 Ø225mm L=9.5m @ 1:150

ATTENUATION TANK
SIZE:9.0m x 8.0m x 1.0m (TBC)
CL: 29.590
TOP OF TANK: 28.607
BASE OF TANK: 27.607
STORAGE VOLUME: 68m³(95% VOID RATIO)
GROUNDWATER LEVEL: GROUNDWATER ENCOUNTERED AT 0.8m BGL DURING THE SITE TESTS CARRIED OUT BY 'SOILTECHNICS' IN JUNE 2024. FURTHER INVESTIGATION WILL BE REQUIRED TO DEMONSTRATE IF ANY ANTI FLOATATION MEASURES ARE REQUIRED.

SWMH09 CL:29.590 IL:28.090
CP
ATTENUATION TANK
SIZE:2.5m x 10.0m x 1.0m (TBC)
CL: 29.590
TOP OF TANK: 29.090
BASE OF TANK: 28.090
STORAGE VOLUME: 24m³(95% VOID RATIO)
GROUNDWATER LEVEL: GROUNDWATER NOT ENCOUNTERED
S3.000 Ø225mm L=15.6m @ 1:150 Horizontal
SWMH08 CL:29.590 IL:28.090
CP
GREEN ROOF AREA AT HIGHER LEVEL
S3.001 Ø225mm L=21.8m @ 1:150
S3.003 Ø225mm L=9.5m @ 1:150
SWMH05 CL:29.590 IL:27.840
S3.002 Ø225mm L=8.4m @ 1:150
SWMH06 CL:29.590 IL:27.893
SWMH07 CL:29.590 IL:27.946
S3.004 Ø225mm L=7.5m @ 1:150



GREEN ROOF TYPICAL DETAIL

NOTES:
1. THIS DRAWING IS NOT TO BE SCALED. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. THIS DRAWING IS BASED ON:
   • SITE PLAN BY 'MORRIS+COMPANY', DWG. 23054-MCO-XX-00-DR-A-01110-P07.
3. DO NOT SCALE FROM THIS DRAWING, WORK TO DIMENSIONS OR CO-ORDINATES PROVIDED.
4. THE CONTRACTOR IS ADVISED TO CHECK THE ACCURACY OF DRAWING INFORMATION TO ACTUAL ON-SITE CONDITIONS. I.E. THE LOCATION, LEVELS, SIZES, CONDITION OF EXISTING SEWERS TO BE RE-USED AND/OR CONNECTED INTO.
5. THE CONTRACTOR SHOULD INSTALL FINAL DRAINAGE CONNECTION PRIOR TO INSTALLING ANY UPSTREAM DRAINAGE TO AVOID POTENTIAL LEVEL ISSUES.
6. REPORT CONFLICTS TO ENGINEER IMMEDIATELY.
7. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING RETAINED SERVICES AND MAKING CONTACT WITH OWNERS OF APPARATUS TO OBTAIN NECESSARY CONSENT FOR EXCAVATION, PROTECTION AND/OR DIVERTING.
8. BURIED OBSTRUCTIONS ENCOUNTERED DURING EXCAVATION THAT CONFLICT WITH PROPOSED WORKS SHOULD BE BROKEN OUT AND REMOVED. RESIDUAL VOIDS TO BE BACKFILLED AND COMPACTED AS PER SPECIFICATION.
9. SURFACE WATER NETWORK ANALYSIS IS BASED ON FSR METHOD, SIZING OF THE DRAINAGE COMPONENTS FOR 1 IN 30 YEARS WITHOUT FLOODING AND ANALYSIS FOR 1 IN 100 YRS +40% CLIMATE CHANGE.
11. SETTING OUT OF DOWNPOINT LOCATIONS TO BE CONFIRMED BY THE M&E DESIGNER.

KEY:

- SITE BOUNDARY
- EXISTING THAMES WATER COMBINED WATER SEWER
- SWMH — PROPOSED FOUL WATER MANHOLE (PCC)
- SWMH CP — PROPOSED CATCHPIT MANHOLE (PCC)
- HB — PROPOSED HYDR-BRAKE MANHOLE (PCC)
- PROPOSED SURFACE WATER PIPE
- PROPOSED ATTENUATION TANK
- PROPOSED GREEN ROOF
- FWMH — PROPOSED FOUL WATER MANHOLE
- CWMH — PRIVATE COMBINED WATER MANHOLE
- PROPOSED FOUL WATER PIPE
- PROPOSED COMBINED WATER PIPE
- NRV — PROPOSED NON-RETURN VALVE
- EXCEEDENCE FLOW ROUTE

Rev	Description	Date
P02	EXCEEDENCE FLOW ROUTES AND TYPICAL GREEN ROOF DETAIL ADDED	21.01.25
P01	PRELIMINARY ISSUE	03.09.24

Drawing Status: PRELIMINARY
Suitability: S2

240 BLACKFRIARS ROAD
LONDON.
SE1 8NW
UNITED KINGDOM

t: +44 (0) 20 7429 3333
e: info@hdrinc.com
w: www.hdrinc.com

Client: REGAL LONDON

Architect: MORRIS+COMPANY

Project: 33-35 JAMESTOWN ROAD LONDON

Title: DRAINAGE STRATEGY GROUND FLOOR LEVEL

HDR Project Number: 10391371
Cad File Name: X10391371 - DRAINAGE 1

Drawn:	Chkd/Appd:	Date:	Scale @ A1:
BS	SM	JUNE'24	1:200

Drawing Number: JTR-HDR-XX-XX-DR-C-102300
Revision: P02

Appendix C

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Bogdan Serban
Site name:	Jamestown
Site location:	NW1 7DJ

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.54006° N
Longitude:	0.14565° W
Reference:	966953299
Date:	Jun 12 2024 10:18

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.28

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	625	625
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default Edited

Q_{BAR} (l/s):	1.18	1.18
1 in 1 year (l/s):	1.01	1.01
1 in 30 years (l/s):	2.72	2.72
1 in 100 year (l/s):	3.78	3.78
1 in 200 years (l/s):	4.43	4.43

Appendix D

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

Half Drain Time : 669 minutes.

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
15 min Summer	31.510	0.510	0.0	1.3	1.3	48.0	O K
30 min Summer	31.654	0.654	0.0	1.3	1.3	61.5	O K
60 min Summer	31.787	0.787	0.0	1.3	1.3	74.1	O K
120 min Summer	31.898	0.898	0.0	1.4	1.4	84.5	O K
180 min Summer	31.943	0.943	0.0	1.4	1.4	88.7	O K
240 min Summer	31.960	0.960	0.0	1.4	1.4	90.3	O K
360 min Summer	31.965	0.965	0.0	1.4	1.4	90.8	O K
480 min Summer	31.949	0.949	0.0	1.4	1.4	89.3	O K
600 min Summer	31.928	0.928	0.0	1.4	1.4	87.3	O K
720 min Summer	31.908	0.908	0.0	1.4	1.4	85.4	O K
960 min Summer	31.868	0.868	0.0	1.4	1.4	81.7	O K
1440 min Summer	31.796	0.796	0.0	1.3	1.3	74.9	O K
2160 min Summer	31.700	0.700	0.0	1.3	1.3	65.9	O K
2880 min Summer	31.613	0.613	0.0	1.3	1.3	57.6	O K
4320 min Summer	31.425	0.425	0.0	1.3	1.3	40.0	O K
5760 min Summer	31.289	0.289	0.0	1.3	1.3	27.2	O K
7200 min Summer	31.202	0.202	0.0	1.3	1.3	19.0	O K
8640 min Summer	31.147	0.147	0.0	1.3	1.3	13.8	O K
10080 min Summer	31.113	0.113	0.0	1.2	1.2	10.6	O K
15 min Winter	31.573	0.573	0.0	1.3	1.3	53.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	150.416	0.0	49.0	26
30 min Summer	97.118	0.0	63.2	41
60 min Summer	59.609	0.0	78.1	70
120 min Summer	35.327	0.0	92.5	128
180 min Summer	25.675	0.0	100.9	186
240 min Summer	20.358	0.0	106.7	244
360 min Summer	14.677	0.0	115.3	362
480 min Summer	11.628	0.0	121.8	470
600 min Summer	9.700	0.0	127.0	520
720 min Summer	8.361	0.0	131.4	580
960 min Summer	6.610	0.0	138.4	708
1440 min Summer	4.739	0.0	148.8	982
2160 min Summer	3.394	0.0	160.3	1392
2880 min Summer	2.675	0.0	168.4	1816
4320 min Summer	1.911	0.0	180.4	2556
5760 min Summer	1.504	0.0	189.5	3232
7200 min Summer	1.249	0.0	196.6	3896
8640 min Summer	1.072	0.0	202.6	4576
10080 min Summer	0.942	0.0	207.6	5248
15 min Winter	150.416	0.0	54.8	26

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

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	31.735	0.735	0.0	1.3	1.3	69.1	O K
60 min Winter	31.886	0.886	0.0	1.4	1.4	83.3	O K
120 min Winter	32.015	1.015	0.0	1.5	1.5	95.5	O K
180 min Winter	32.070	1.070	0.0	1.5	1.5	100.6	O K
240 min Winter	32.094	1.094	0.0	1.5	1.5	102.9	O K
360 min Winter	32.109	1.109	0.0	1.5	1.5	104.3	O K
480 min Winter	32.099	1.099	0.0	1.5	1.5	103.4	O K
600 min Winter	32.078	1.078	0.0	1.5	1.5	101.3	O K
720 min Winter	32.050	1.050	0.0	1.5	1.5	98.7	O K
960 min Winter	32.002	1.002	0.0	1.5	1.5	94.3	O K
1440 min Winter	31.906	0.906	0.0	1.4	1.4	85.2	O K
2160 min Winter	31.768	0.768	0.0	1.3	1.3	72.2	O K
2880 min Winter	31.639	0.639	0.0	1.3	1.3	60.1	O K
4320 min Winter	31.357	0.357	0.0	1.3	1.3	33.6	O K
5760 min Winter	31.193	0.193	0.0	1.3	1.3	18.1	O K
7200 min Winter	31.116	0.116	0.0	1.2	1.2	10.9	O K
8640 min Winter	31.082	0.082	0.0	1.1	1.1	7.7	O K
10080 min Winter	31.070	0.070	0.0	1.0	1.0	6.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	97.118	0.0	70.7	40
60 min Winter	59.609	0.0	87.4	68
120 min Winter	35.327	0.0	103.6	126
180 min Winter	25.675	0.0	113.0	184
240 min Winter	20.358	0.0	119.5	240
360 min Winter	14.677	0.0	129.2	354
480 min Winter	11.628	0.0	136.5	464
600 min Winter	9.700	0.0	142.3	570
720 min Winter	8.361	0.0	147.1	658
960 min Winter	6.610	0.0	155.0	748
1440 min Winter	4.739	0.0	166.6	1058
2160 min Winter	3.394	0.0	179.5	1516
2880 min Winter	2.675	0.0	188.7	1960
4320 min Winter	1.911	0.0	202.1	2680
5760 min Winter	1.504	0.0	212.2	3288
7200 min Winter	1.249	0.0	220.2	3888
8640 min Winter	1.072	0.0	226.9	4416
10080 min Winter	0.942	0.0	232.5	5144

Model Details

Storage is Online Cover Level (m) 34.000

Cellular Storage Structure

Invert Level (m) 31.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	99.0	0.0	2.001	0.0	0.0
2.000	99.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0057-2000-2000-2000
Design Head (m)	2.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	57
Invert Level (m)	31.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	2.0
Flush-Flo™	0.247	1.3
Kick-Flo®	0.506	1.1
Mean Flow over Head Range	-	1.5

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	1.2	1.200	1.6	3.000	2.4	7.000	3.6
0.200	1.3	1.400	1.7	3.500	2.6	7.500	3.7
0.300	1.3	1.600	1.8	4.000	2.7	8.000	3.8
0.400	1.3	1.800	1.9	4.500	2.9	8.500	3.9
0.500	1.1	2.000	2.0	5.000	3.0	9.000	4.0
0.600	1.2	2.200	2.1	5.500	3.2	9.500	4.1
0.800	1.3	2.400	2.2	6.000	3.3		
1.000	1.5	2.600	2.3	6.500	3.4		