SURFACE WATER STORAGE REQUIREMENT:
PEAK RATE 3 TIMES GREENFIELD

TOTAL REQUIRED FOR M100-60+40% = 844m³

PROPOSED LOCATION FOR SURFACE WATER ATTENUATION TANK 1:

PLAN AREA: 294m²
TANK DEPTHS RANGING FROM 1.5m – 0.5m (IN 0.5m INCREMENTS)

MAXIMUM CAPACITY: 306m³

CL: 30.9m – 29.5m
IL: 27.5m
SL: 29m (MAXIMUM)

EXISTING MANHOLE ON THAMES WATER SEWER (BASED ON TOWER SURVEYS LIMITED MORRISON'S DRAINAGE SURVEY).
CL = 33.40
IL = 25.40

EXISTING MANHOLE ON THAMES WATER SEWER (BASED ON TOWER SURVEYS LIMITED MORRISON'S DRAINAGE SURVEY)
CL = 33.50
IL = 25.40

ALIGNMENT OF EXISTING THAMES WATER SEWER (BASED ON THAMES WATER ASSET PLAN).

EXISTING MANHOLE ON THAMES WATER SEWER (BASED ON TOWER SURVEYS LIMITED MORRISON'S DRAINAGE
CL = 33.93 (APPROX)
IL = 25.63 (APPROX)

EXISTING MANHOLE ON THAMES WATER SEWER (BASED ON TOWER SURVEYS LIMITED MORRISON'S DRAINAGE SURVEY).
CL = 33.15
IL = 25.45

ALIGNMENT OF EXISTING THAMES WATER SEWER (BASED ON MORRISON'S DRAINAGE SURVEY).

EXISTING MANHOLE ON THAMES WATER SEWER (BASED ON TOWER SURVEYS LIMITED MORRISON'S DRAINAGE SURVEY).
CL = 33.15
IL = 25.56

EXISTING MANHOLE ON THAMES WATER SEWER (BASED ON TOWER SURVEYS LIMITED MORRISON'S DRAINAGE SURVEY).
CL = 33.10
IL = 29.71

EXISTING GILBEYS YARD SURFACE WATER MANHOLE
CL = 33.80
IL = 31.15

EXISTING GILBEYS YARD FOUL WATER MANHOLE
CL = 33.80
IL = 30.55.

BACKDROPS

EXISTING THAMES WATER SEWER TO BE ABANDONED AND REMOVED.

EXISTING MANHOLE ON THAMES WATER SEWER (BASED ON TOWER SURVEYS LIMITED MORRISON'S DRAINAGE
CL = 33.71
IL = 27.00

PROPOSED LOCATION FOR SURFACE WATER ATTENUATION TANK 2:

3m WIDE, 72m LENGTH, 2.5m DEEP

CAPACITY: 540m³

CL: 33.6m
IL: 29.6m
SL: 32.1m

1372x814 COMBINED WATER
450ø COMBINED WATER
600ø SEWER
225ø SURFACE WATER SEWER

AECOM

PROJECT

MORRISONS, CAMDEN

CLIENT

BARRATT LONDON (ALDGATE)

CONSULTANT

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Tel +44 (0)207 963 9800
www.aecom.com

NOTES

LEGEND

CL	COVER LEVEL
IL	INVERT LEVEL
SL	SOFFIT LEVEL
	EXISTING THAMES WATER SEWER
	PROPOSED SURFACE WATER ATTENUATION TANKS

ISSUE/REVISION

P5	NYI	STORAGE TANK AMENDED.
P4	29.06.17	ARCHITECT MASTERPLAN UPDATED AND ATTENUATION TANKS AMENDED AS CLOUDED
P3	02.06.17	ARCHITECT MASTERPLAN UPDATED AND ATTENUATION TANKS AMENDED AS CLOUDED
P2	09.05.17	CHANGES TO ATTENUATION TANKS AS CLOUDED
P1	12.12.16	FOR INFORMATION
I/R	DATE	DESCRIPTION

KEY PLAN

PURPOSE OF ISSUE

FOR INFORMATION

PROJECT NUMBER

60493836

SHEET TITLE

SURFACE WATER DRAINAGE STRATEGY

SHEET NUMBER

1040

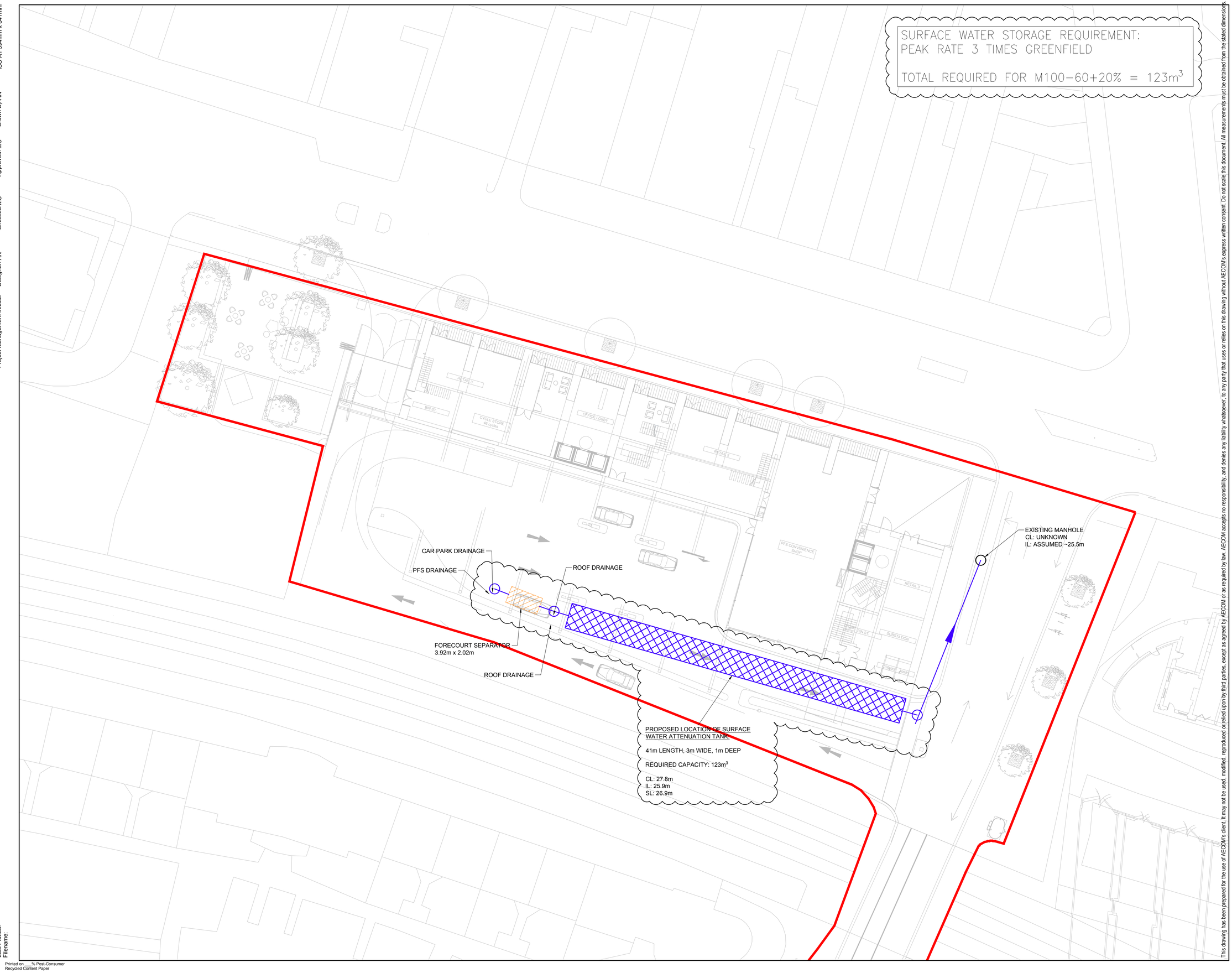
SCALE: 1:500 @ A1 **REV:** P5

Project Management Initials: Designer: AN Checked: MC Approved: MC Drawn By: AN ISO A1 594mm x 841mm

Last Plotted:
Filename:

SURFACE WATER STORAGE REQUIREMENT:
PEAK RATE 3 TIMES GREENFIELD

TOTAL REQUIRED FOR M100-60+20% = 123m^3



AECOM

PROJECT

MORRISONS, CAMDEN

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NOTES

LEGEND

CL	COVER LEVEL
IL	INVERT LEVEL
SL	SOFFIT LEVEL
	FORECOURT SEPARATOR
	PROPOSED SURFACE WATER ATTENUATION TANKS
	PROPOSED SURFACE WATER MANHOLES
	EXISTING MANHOLE
	PROPOSED SURFACE WATER SEWER

ISSUE/REVISION

P5	NYI	STORAGE TANK AMENDED.
P4	28.06.17	CHANGES TO ARCHITECT LAYOUT AND DRAINAGE
P3	02.06.17	CHANGES TO ARCHITECT LAYOUT AND DRAINAGE
P2	09.05.17	CHANGES TO ARCHITECT LAYOUT, DRAINAGE AND LEGEND
P1	12.12.16	FOR INFORMATION
I/R	DATE	DESCRIPTION

KEY PLAN

PURPOSE OF ISSUE

FOR INFORMATION

PROJECT NUMBER

60493836

SHEET TITLE

SURFACE WATER DRAINAGE STRATEGY - PFS SITE

SHEET NUMBER

1041

SCALE: 1:200 @ A1 **REV:** P5

Appendix J Surface Water Attenuation Calculations

CALCULATION SHEET

Prepared By: AN Date: 05/10/2017
Checked By: MC Date: 05/10/2017
Rev: 2

Project: Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Site Location	Camden, London	
SAAR	700	mm
Soil Type	4	
M5-D60	21	mm
r	0.42	
Climate Change Factor	40	%
Total Site Area	3.1154	ha

Note

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CALCULATION SHEET

Prepared By: AN Date: 05/10/2017
Checked By: MC Date: 05/10/2017
Rev: 2

Project: Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Total Site Area 2.7224 ha

Existing Site Area

Surface Type	**Area (m^2)**	**Runoff Coefficient**	**Equivalent Runoff Area (m^2)**
Impervious roof & pavement	24,502	0.95	23277
Green roof	0	0.8	0
Other semi pervious surfaces	0	0.8	0
Landscape	2,722	0.25	681
Total	**27224**	**Total**	**23957**

Existing Equivalent Runoff Area 23957 m2
Existing Discharge Rate 335.40 l/s

Note:
1. Assume the existing drainage is designed for 50 mm/hour rainfall event equating to 0.014 l/m2/s

Note

AECOM

CALCULATION SHEET

Prepared By: AN Date: 05/10/2017
Checked By: MC Date: 05/10/2017
Rev: 2

Project: Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Total Site Area 2.7224 ha

Proposed Site Area

Surface Type	**Area (m^2)**	**Runoff**	**Equivalent**
Impervious roof & pavement	15,161	0.95	14403
Green roof	330	0.8	264
Other semi pervious surfaces	6,231	0.8	4985
Landscape	5,502	0.25	1376
Total	**27,224**	**Total**	**21027**

Proposed Equivalent Runoff Area 21027 m2
Proposed Discharge Rate 97.50 l/s

Note

Proposed Discharge Rate is based on Greenfield rates Q100 = 32.5 l/s, (

AECOM

Prepared By: AN Date: 05/10/2017
Checked By: MC Date: 05/10/2017
Rev: 2

Project: Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Proposed Discharge Rate	97.50	l/s
Effective Runoff Area	21027	m2
Total Runoff Area	27,224	m2

Required Storage Volume

Storm Duration (min)	M30-D Rainfall Depth (mm)	M30-D Rainfall Volume (m3)	Discharge Rate (l/s)	Required Storage Volume for a 1 in 30 Year Event (m3)
30	24.85	522	97.50	347
60	30.87	649	97.50	298
120	38.70	814	97.50	112
240	43.02	905	97.50	n/a
360	52.33	1100	97.50	n/a
600	60.12	1264	97.50	n/a

Required Storage Volume	347	m3

Note

Proposed Discharge Rate is based on Greenfield rates Q100 = 32.5 l/s, Qmax = 97.5 l/s

AECOM CALCULATION SHEET

Prepared By: AN Date: 05/10/2017
Checked By: MC Date: 05/10/2017
Rev: 2

Project: Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Proposed Discharge Rate	97.50	l/s
Effective Runoff Area	21027	m2
Total Runoff Area	27,224	m2

Required Storage Volume

Storm Duration (min)	M30-D Rainfall Depth (mm)	M100-D (mm)+40% Rainfall Volume (m3)	Discharge Rate (l/s)	Required Storage Volume for a 1 in 100 Year+40% Event (m3)
30	45.43	955	97.50	780
60	56.84	1195	97.50	844
120	71.03	1493	97.50	791
240	78.63	1653	97.50	249
360	94.89	1995	97.50	n/a
600	108.34	2278	97.50	n/a

Required Storage Volume	844	m3

Note

Proposed Discharge Rate is based on Greenfield rates Q100 = 32.5 l/s, Qmax = 97.5 l/s

AECOM CALCULATION SHEET

Prepared By AN Date: 05/10/2017
Checked By MC Date: 05/10/2017
Rev: 2

Project: PFS Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Site Location	Camden, London	
SAAR	700	mm
Soil Type	4	
M5-D60	21	mm
r	0.42	
Climate Change Factor	20	%
Total Site Area	0.393	ha

Note

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CALCULATION SHEET

Prepared By AN Date: 05/10/2017
Checked By MC Date: 05/10/2017
Rev: 2

Project: PFS Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Total Site Area 0.393 ha

Existing Site Area

Surface Type	**Area (m^2)**	**Runoff Coefficient**	**Equivalent Runoff Area (m^2)**
Impervious roof & pavement	3,930	0.95	3734
Green roof	0	0.8	0
Other semi pervious surfaces	0	0.8	0
Landscape	0	0	0
Total	**3930**	**Total**	**3734**

Existing Equivalent Runoff Area 3734 m2
Existing Discharge Rate 52.27 l/s

Note:
1. Assume the existing drainage is designed for 50 mm/hour rainfall event equating to 0.014 l/m2/s

Note

CALCULATION SHEET

Prepared By AN Date: 05/10/2017
Checked By MC Date: 05/10/2017
Rev: 2

Project: PFS Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Total Site Area 0.393 ha

Proposed Site Area

Surface Type	**Area (m^2)**	**Runoff**	**Equivalent**
Impervious roof & pavement	3,211	0.95	3050
Green roof	596	0.8	477
Other semi pervious surfaces	19	0.8	15
Landscape	104	0.25	26
Total	**3,930**	**Total**	**3568**

Proposed Equivalent Runoff Area 3568 m2
Proposed Discharge Rate 14.10 l/s

Note

Proposed Discharge Rate is based on Greenfield rates Q100 = 4.7 l/s Qr

AECOM CALCULATION SHEET

Prepared By AN Date: 05/10/2017
Checked By MC Date: 05/10/2017
Rev: 2

Project: PFS Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Proposed Discharge Rate	14.10	l/s
Effective Runoff Area	3568	m2
Total Runoff Area	3,930	m2

Required Storage Volume

Storm Duration (min)	M30-D Rainfall Depth (mm)	M30-D Rainfall Volume (m3)	Discharge Rate (l/s)	Required Storage Volume for a 1 in 30 Year Event (m3)
30	24.85	89	14.10	63
60	30.87	110	14.10	59
120	38.70	138	14.10	37
240	43.02	154	14.10	n/a
360	52.33	187	14.10	n/a
600	60.12	215	14.10	n/a

Required Storage Volume	63	m3

Note

Proposed Discharge Rate is based on Greenfield rates Q100 = 4.7 l/s Qmax

AECOM CALCULATION SHEET

Prepared By AN Date: 05/10/2017
Checked By MC Date: 05/10/2017
Rev: 2

Project: PFS Morrisons Chalk Farm

Subject: Surface Water Storage Estimate

Proposed Discharge Rate	14.10	l/s
Effective Runoff Area	3568	m2
Total Runoff Area	3,930	m2

Required Storage Volume

Storm Duration (min)	M30-D Rainfall Depth (mm)	M100-D (mm)+20% Rainfall Volume (m3)	Discharge Rate (l/s)	Required Storage Volume for a 1 in 100 Year+20% Event (m3)
30	38.94	139	14.10	114
60	48.72	174	14.10	123
120	60.88	217	14.10	116
240	67.40	241	14.10	37
360	81.34	290	14.10	n/a
600	92.87	331	14.10	n/a

Required Storage Volume	123	m3

Note

Proposed Discharge Rate is based on Greenfield rates Q100 = 4.7 l/s Qmax

Appendix K London Borough of Camden SuDS Proforma

Advice Note on contents of a Surface Water Drainage Statement

London Borough of Camden

1. Introduction

1.1 The Government has strengthened planning policy on the provision of sustainable drainage and new consultation arrangements for 'major' planning applications will come into force from 6 April 2015 as defined in the Written Ministerial Statement (18th Dec 2014).

1.2 The new requirements make Lead Local Flood Authorises statutory consultees with respect to flood risk and SuDS for all major applications. Previously the Environment Agency had that statutory responsibility for sites above 1ha in flood zone 1.

1.3 Therefore all 'major' planning applications submitted from 6 April 2015 are required demonstrate compliance with this policy and we'd encourage this is shown in a **Surface Water Drainage Statement**.

1.4 The purpose of this advice note is to set out what information should be included in such statements.

2. Requirements

2.1 It is essential that the type of Sustainable Drainage System (SuDS) for a site, along with **details of its extent and position**, is identified within the planning application to clearly demonstrate that the proposed SuDS can be accommodated within the development.

2.2 It will now not be acceptable to leave the design of SuDs to a later stage to be dealt with by planning conditions.

2.3 The NPPF paragraph 103 requires that developments do not increase flood risk elsewhere, and gives priority to the use of SuDS. Major developments must include SuDS for the management of run-off, unless demonstrated to be inappropriate. The proposed minimum standards of operation must be appropriate and as such, a **maintenance plan** should be included within the Surface Water Drainage Statement,clearly demonstrating that the SuDS have been designed to ensure that the maintenance and operation requirements are economically proportionate Planning Practice Guidance suggests that this should be considered by reference to the costs that would be incurred by consumers for the use of an effective drainage system connecting directly to a public sewer.

2.4 Camden Council will use planning conditions or obligations to ensure that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.

2.5 Within Camden, SuDS systems must be designed in accordance with London Plan policy 5.13. This requires that developments should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve **greenfield run-off rates** and ensure that surface water run-off is managed as close to its source as possible in line with the following **drainage hierarchy**:

1 store rainwater for later use
2 use infiltration techniques, such as porous surfaces in non-clay areas
3 attenuate rainwater in ponds or open water features for gradual release
4 attenuate rainwater by storing in tanks or sealed water features for gradual release
5 discharge rainwater direct to a watercourse
6 discharge rainwater to a surface water sewer/drain
7 discharge rainwater to the combined sewer.

2.6 The hierarchy above seeks to ensure that surface water run-off is controlled as near to its source as possible to mimic natural drainage systems and retain water on or near to the site, in contrast to traditional drainage approaches, which tend to pipe water off-site as quickly as possible.

2.7 Before disposal of surface water to the public sewer is considered all other options set out in the drainage hierarchy should be exhausted. When no other practicable alternative exists to dispose of surface water other than the public sewer, the Water Company or its agents should confirm that there is adequate spare capacity in the existing system taking future development requirements into account.

2.8 Best practice guidance within the non-statutory technical standards for the design, maintenance and operation of sustainable drainage systems will also need to be followed. Runoff volumes from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the **greenfield runoff volume** for the same event.

2.9 Camden Development Policy 23 (Water) requires developments to reduce pressure on combined sewer network and the risk of flooding by limiting the rate of run-off through sustainable urban drainage systems. This policy also requires that developments in areas known to be at risk of surface water flooding are designed to cope with being flooded. Camden's SFRA surface water flood maps, updated SFRA figures 6 (LFRZs), and 4e (increased susceptibility to elevated groundwater) , as well as the Environment Agency updated flood maps for surface water (ufmfsw), should be referred to when determining whether developments are in an area at risk of flooding.

2.10 Camden Planning Guidance 3 (CPG3) requires developments to achieve a greenfield run off rate once SuDS have been installed. Where it can be demonstrated that this is not feasible, a minimum 50% reduction in run off rate across the development is required. Further guidance on how to reduce the risk of flooding can be found in CPG3 paragraphs 11.4-11.8.

2.11 Where an application is part of a larger site which already has planning permission it is essential that the new proposal does not compromise the drainage scheme already approved.

3. Further information and guidance

3.1 Applicants are strongly advised to discuss their proposals with the Lead Local Flood Authority at the pre-application stage to ensure that an acceptable SuDS scheme is submitted.

3.2 For general clarification of these requirements please Camden's Local Planning Authority or Lead Local Flood Authority

Surface Water Drainage Pro-forma for new developments

This pro-forma accompanies our advice note on surface water drainage. Developers should complete this form and submit it to the Local Planning Authority, referencing from where in their submission documents this information is taken. The pro-forma is supported by the Defra/EA guidance on Rainfall Runoff Management and uses the storage calculator on www.UKsuds.com. This pro-forma is based on current industry best practice and focuses on ensuring surface water drainage proposals meet national and local policy requirements. The pro-forma should be considered alongside other supporting SuDS Guidance.

1. Site Details

Site	Morrisons Store and Petrol Fueling Station
Address & post code or LPA reference	Morrisons, Chalk Farm Road, Camden, NW1 8AA
Grid reference	5278412E, 184106N (Approximate)
Is the existing site developed or Greenfield?	Developed
Is the development in a LFRZ or in an area known to be at risk of surface or ground water flooding? If yes, please demonstrate how this is managed, in line with DP23?	Site located in CDA Group3_003 but not in an LFRZ. See Flood Risk Assessment and Drainage Strategy for more information
Total Site Area served by drainage system (excluding open space) (Ha)*	2.45Ha

***** The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers
Impermeable area (ha)	2.84	2.45	-0.39	If the proposed amount of impermeable surface is greater, then runoff rates and volumes will increase. Section 6 must be filled in. If proposed impermeability is equal or less than existing, then section 6 can be skipped and section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)	Sewer	Sewer	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers
Existing and proposed MicroDrainage calculations	x		Refer to drainage calculations appended to Flood Risk Assessment and Drainage Strategy Report	Please provide MicroDrainage calculations of existing and proposed run-off rates and volumes in accordance with a recognised methodology or the results of a full infiltration test (see line below) if infiltration is proposed.
Infiltration		x	Site rests above London Clay	e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse		x	No watercourse in locality	e.g. Is there a watercourse nearby?
To surface water sewer	x		Discharge to TWUL combined sewer	Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above		x		e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.
Has the drainage proposal had regard to the SuDS hierarchy?	x		See Flood Risk Assessment and Drainage Strategy for more information	Evidence must be provided to demonstrate that the proposed Sustainable Drainage strategy has had regard to the SuDS hierarchy as outlined in Section 2.5 above.
Layout plan showing where the sustainable drainage infrastructure will be located on site.	x		See Surface Water Drainage Strategy for more information	Please provide plan reference numbers showing the details of the site layout showing where the sustainable drainage infrastructure will be located on the site. If the development is to be constructed in phases this should be shown on a separate plan and confirmation should be provided that the sustainable drainage proposal for each phase can be constructed and can operate independently and is not reliant on any later phase of development.

4. Peak Discharge Rates – This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	% Difference (difference /existing x 100)	Notes for developers
Greenfield QBAR		N/A	N/A	N/A	QBAR is approx. 1 in 2 storm event. Provide this if Section 6 (QBAR) is proposed.
1 in 1	188.6	193.8	None	None	Proposed discharge rates (with mitigation) should aim to be equivalent to greenfield rates for all corresponding storm events. As a minimum, peak discharge rates must be reduced by 50% from the existing sites for all corresponding rainfall events.
1 in 30	387.7	193.8	193.8	50%	
1in 100	498.2	193.8	304.6	61%	
1 in 100 plus climate change	N/A	193.8	N/A	N/A	The proposed 1 in 100 +CC peak discharge rate (with mitigation) should aim to be equivalent to greenfield rates. As a minimum, proposed 1 in 100 +CC peak discharge rate must be reduced by 50% from the existing 1 in 100 runoff rate sites.

5. Calculate additional volumes for storage –The total volume of water leaving the development site. New hard surfaces potentially restrict the amount of stormwater that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

	Greenfield runoff volume (m^3)	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers
1 in 1	79	283	266	-17	Proposed discharge volumes (with mitigation) should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable and as a minimum should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30	193	692	652	-40	
1in 100 6 hour	527	1890	1777	-113	
1 in 100 6 hour plus climate change	738	2646	2489	-157	The proposed 1 in 100 +CC discharge volume should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable. As a minimum, to mitigate for climate change the proposed 1 in 100 +CC volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. Calculate attenuation storage – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse to be limited to an acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the greenfield discharge rate.

		Notes for developers
Storage Attenuation volume (Flow rate control) required to meet greenfield run off rates (m^3)	1624m3 (1 in 100+CC event)	Volume of water to attenuate on site if discharging at a greenfield run off rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to reduce rates by 50% (m^3)	745m3 (1 in 100+CC event)	Volume of water to attenuate on site if discharging at a 50% reduction from existing rates. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to meet [OTHER RUN OFF RATE (as close to greenfield rate as possible] (m^3)		Volume of water to attenuate on site if discharging at a rate different from the above – please state in 1st column what rate this volume corresponds to. On previously developed sites, runoff rates should not be more than three times the calculated greenfield rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to retain rates as existing (m^3)	197m3 to 1 in 100+CC event	Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing
Percentage of attenuation volume stored above ground,	1% in green roofs (832m2)	Percentage of attenuation volume which will be held above ground in swales/ponds/basins/green roofs etc. If 0, please demonstrate why.

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on site storage. Firstly, can infiltration work on site?

			Notes for developers
Infiltration	**State the Site's Geology and known Source Protection Zones (SPZ)**	London Clay underlying made ground. Site not located in SPZ	Avoid infiltrating in made ground. Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?	Infiltration not proposed	Infiltration rates should be no lower than $1x10^{-6}$ m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level	Infiltration not viable due to extensive basement throughout the site and perched groundwater at depths up to 1.5m below ground level	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.

	Were infiltration rates obtained by desk study or infiltration test?	None obtained	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back up attenuation scheme is provided..
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	Yes, refer to the geological report	Advice on contaminated Land in Camden can be found on our supporting documents webpage Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above, is infiltration feasible?	**Yes/No? If the answer is No, please identify how the storm water will be stored prior to release**	No, storm water will be stored in underground attenuation tanks	If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

Storage requirements

The developer must confirm that either of the two methods for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at the greenfield run off rate. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers
Please confirm what option has been chosen and how much storage is required on site.	Option 1. 967m3 of underground attenuation is require	The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Please confirm

		Notes for developers
Which Drainage Systems measures have been used, including green roofs?	Underground attenuation tanks and green roofs/roof gardens	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C697.
Drainage system can contain in the 1 in 30 storm event without flooding	Confirmed compliant	This a requirement for sewers for adoption & is good practice even where drainage system is not adopted.
Will the drainage system contain the 1 in 100 +CC storm event? If no please demonstrate how buildings and utility plants will be protected.	Confirmed compliant	National standards require that the drainage system is designed so that flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.
Any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.	Confirmed compliant	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased.
How will exceedance events be catered on site without increasing flood risks (both on site and outside the development)?	Flood water from exceedance events will remain on site with pooling upon the podium and within the kerbs of the estate roads	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased. Exceedance events are defined as those larger than the 1 in 100 +CC event.
How are rates being restricted (vortex control, orifice etc)	Vortex control	Detail of how the flow control systems have been designed to avoid pipe blockages and ease of maintenance should be provided.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	Morrisons	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma.
How is the entire drainage system to be maintained?	Via Morrisons Building Management	If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each feature. If it is to be maintained by others than above please give details of each feature and the maintenance schedule. Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided. Details must demonstrate that maintenance and operation requirements are economically proportionate. Poorly maintained drainage can lead to increased flooding problems in the future.

9. Evidence Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your proforma, in particular exceedance routes and ownership and location of SuDS (maintenance access strips etc

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2	Flood Risk Assessment and Drainage Strategy, Appendix J	34
Section 3	Flood Risk Assessment and Drainage Strategy	21
Section 4	Flood Risk Assessment and Drainage Strategy, Appendix J	34
Section 5	Flood Risk Assessment and Drainage Strategy, Appendix J	34
Section 6	Flood Risk Assessment and Drainage Strategy, Appendix J	34
Section 7		
Section 8		

The above form should be completed using evidence from the Flood Risk Assessment and site plans. It should serve as a summary sheet of the drainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing. If there is an increase in rate or volume, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with.

This form is completed using factual information from the Flood Risk Assessment and Site Plans and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By Malcolm Crowther
Qualification of person responsible for signing off this pro-forma CEng MCIWEM

Company AECOM
On behalf of (Client's details) Chris Groves, Senior Technical Manager, Barratt London
Date: June 16th 2017

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Appendix G **Architect's Plans**