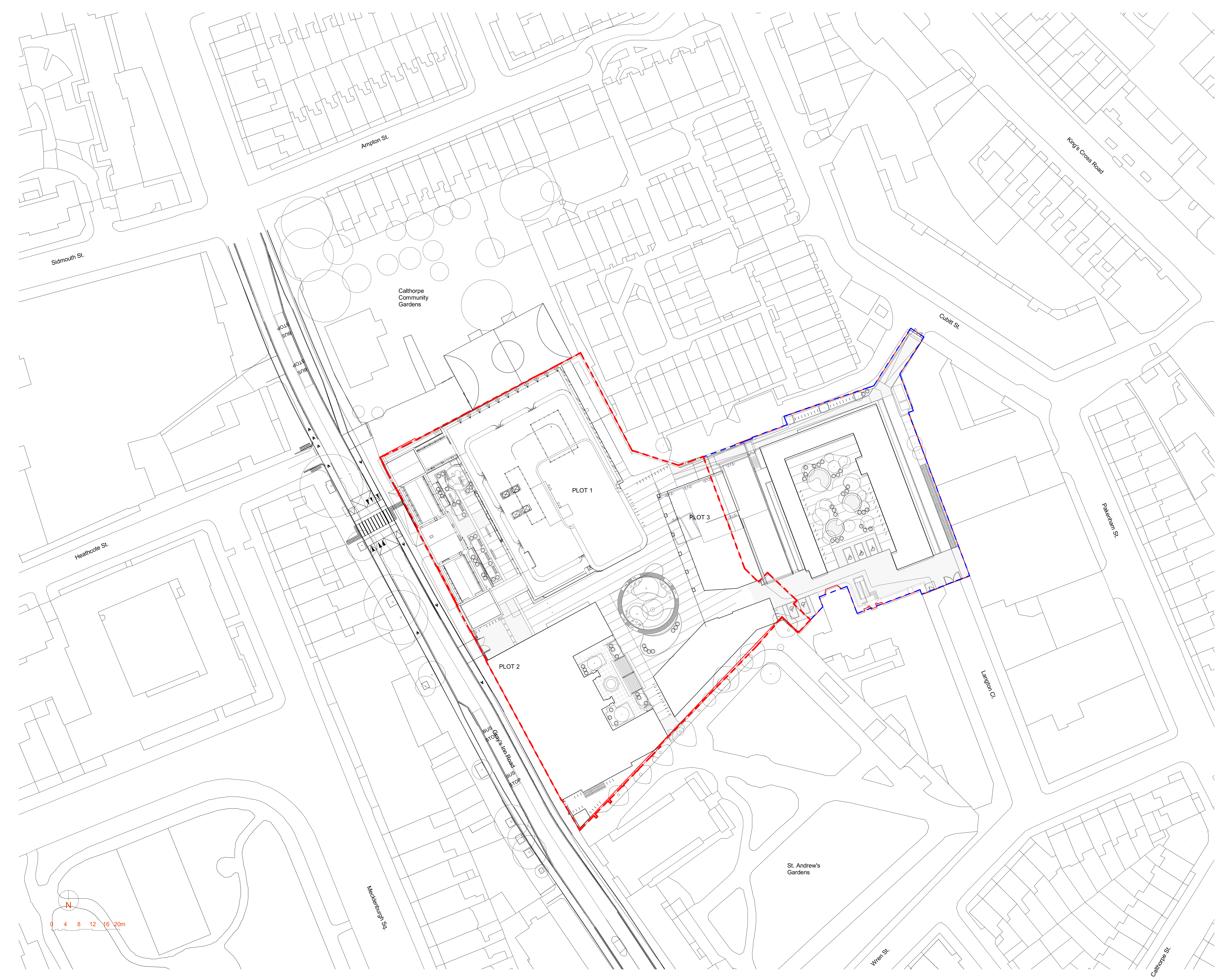
APPENDIX 4
ARCHITECTURAL SITE PLANS



Rev	Description	Date
P01	Stage 2 Issue	04/06/18
P02	Issued to Construction Advisor	18/08/18
P03	Issued for Information	14/02/19
P04	Stage 3 Draft Issue for Costing	15/03/19
P05	Stage 3 Issue	29/03/19
P06	Issued for Review & Comment/ Approval	20/09/19

Site Boundary Key

Site Boundary

Additional Planning Boundary

Note: Site boundary shown for information purposes only and does not represent a legal site demise

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Hawkins\Brown

Project
IoN/DRI Redevelopment Project
256 Grays Inn Road
London
WC1X 8LD

Drawing
Proposed Site Plan

Scale @ A1	Date
1 : 500	01/18/18

Drawn By	Checked By
TC	EG

Job Number	Status	Purpose of Issue
17056	S3/S4	For Review and Comment/Approval

Drawing No. Rev
BEMP-HBA-SW-XX-DR-A-20-0010P06

APPENDIX 5
CAMDEN COUNCIL DRAINAGE PRO-FORMA

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	UCL - IoN / DRI
Address & post code or LPA reference	256 Grays Inn Rd, London WC1X 8LD
Grid reference	TQ307824
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 is located in a low flood zone risk
Total Site Area served by drainage system (excluding open space) (Ha)*	0.979

***** 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)	0.979	0.979	0	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		Existing run off rates calculated using The Wallingford Procedure. Proposed MD calculations.	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		e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse		x		e.g. Is there a watercourse nearby?
To surface water sewer		x	Pre-development enquiry (FW and SW confirmed)	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		Drainage Philosophy Report	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		DWG, ref: BEMP-RAM-SW-00-DR-C-0110	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	3.6	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	84.8	42.8	-42.0	-50	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	194.1	48.1	-146.0	-75	
1in 100	250.7	48.1	-202.6	-81	
1 in 100 plus climate change	N/A	48.2	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	22	69	55	-14	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	54	168	136	-32	
1in 100 6 hour	187	508	483	-25	
1 in 100 6 hour plus climate change	262	711	680	-31	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)	752	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)	408	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)	323 (Restricted outflow = 48.2l/s)	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)	113	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,	58	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 FORMATION	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?	No - 4.8 X 10-9 m/s	Infiltration rates should be no lower than 1×10^{-6} m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level	N/A	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?	INFILTRATION TEST	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.	NO	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 - attenuate as close to course as possible. Blue roof, permeable paving, geocellular sub-surface storage structures	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.	SIMPLE	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?	GREEN ROOFS, POROUS PAVING & SUB SURFACE STORAGE	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	YES	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.	YES	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.	YES	**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)?	EXCEEDANCE FLOWS TO BE CONTAINED WITHIN THE DEVELOPMENT BOUNDARY.	**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 FLOW 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.	THAMES WATER	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?	REFER TO SuDS MAINTENANCE DETAILS ATTACHED.	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	DWG, ref: BEMP-RAM-SW-00-DR-C-0110	
Section 3	MICRODRAINAGE RESULTS AND DWG, ref: BEMP-RAM-SW-00-DR-C-0110	
Section 4	MICRODRAINAGE RESULTS	
Section 5	MICRODRAINAGE RESULTS	
Section 6	MICRODRAINAGE RESULTS	
Section 7	DWG, ref: BEMP-RAM-SW-00-DR-C-0110	
Section 8	MICRODRAINAGE RESULTS	

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 A.S.LIVINGSTON……………………………………………………………………………………......................

Qualification of person responsible for signing off this pro-forma MEng, GMICE..

Company RAMBOLL UK……………………………………………………………………………,...

On behalf of (Client's details) UCL...

Date: 08/03/2019……………………….............................

Job number	**1620004664**
Sheet number	**01/01**
Date	**23/04/2018**
Eng	**AL**
Checked	**MM**

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Project UCL

Estimation of Urban Realm Peak Flow Rate Runoff

The aim of this calculation is to determine the peak discharge runoff rate of the existing brownfield site for 1:30 and 1:100 year return period events based on The Wallingford Procedure 'Modified Rational Method'

Q = Proposed Runoff Rates
C = Dimensionless Coefficient
I = Rainfall Intensity mm/hr
A = Area (ha)

FSR M5-60 = 20
Ratio R = 0.45

A = 0.255 Refurbished Area
A = 0.724 New build area
A = 0.979 Total site area

$$Q = 2.78 \times C \times I \times A$$

Z1 from Fig A.3b for 15 min duration= 0.625

M5-15 = 0.625 x 20 = 12.5 mm

Z2 values taken from Table A1 of Volume 4 of Modified Rational Method for 12.5mm rainfall

Storm Event	**Q 1 year**	**Q 2 year**	**Q 30 year**	**Q 100 year**	**Q 100 year + 40% C/C**
Ratio Z2	7.75	9.94	18.88	24.38	34.13
Average Point Intensity	32.98	39.75	75.5	97.5	136.5
Areal Reduction Factor	0.94	0.94	0.94	0.94	0.94

Storm Event	**Q 1 year**	**Q 2 year**	**Q 30 year**	**Q 100 year**	**Q 100 year + 40% C/C**
Rainfall (mm/hr)	31.00	37.37	70.97	91.65	128.31
Discharge Rates (l/s)	21.98	26.49	50.31	64.97	90.96

Existing Surface Water Discharge:

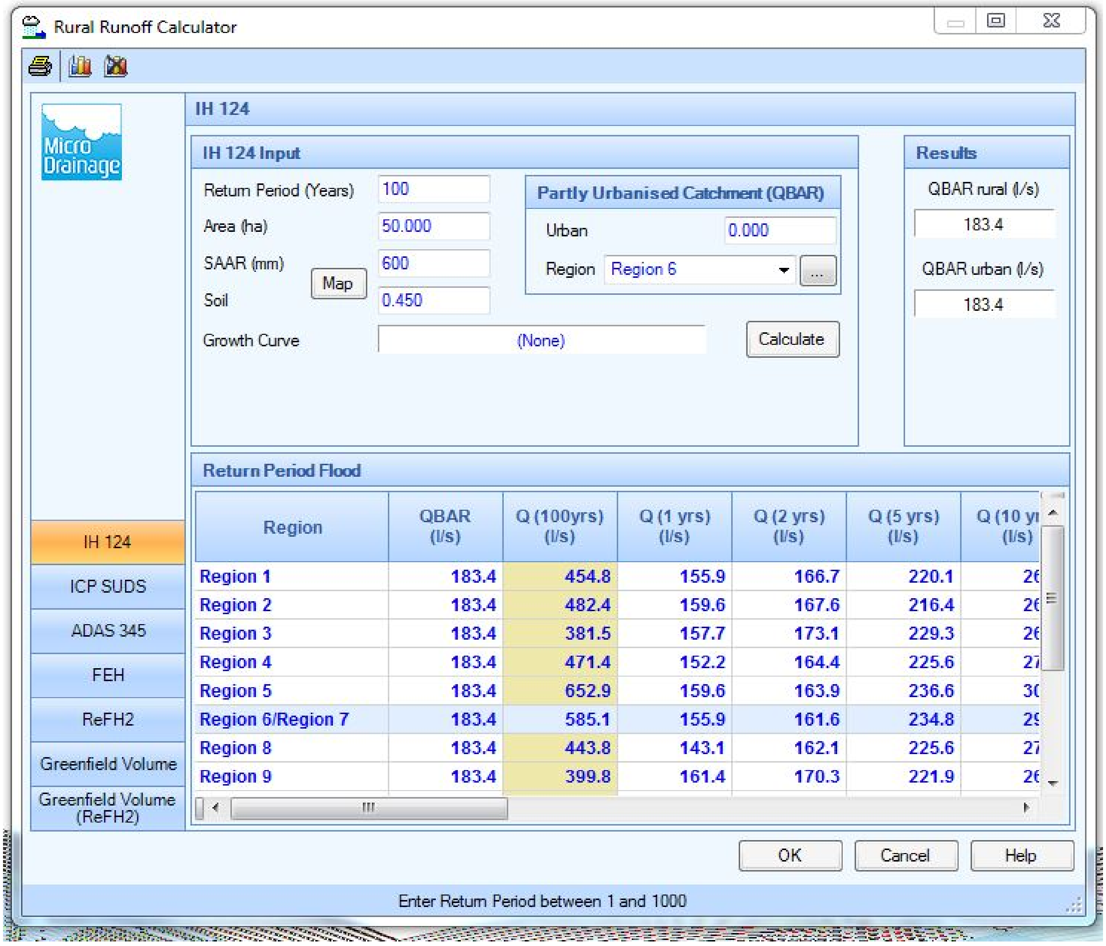
Proposed urban realm peak surface water runoff (100 year + 40% - restricted to existing peak runoff)= 91.0 l/s

Proposed urban realm peak surface water runoff (30 year) = 50.3 l/s

Proposed urban realm peak surface water runoff (1 year) = 22.0 l/s

In accordance with the London Plan the site will aim to reduce brownfied peak runoff rates by 50%

Return Period		1yr	30yr	100yr	**100yr +40%**
Peak run off rate	l/s	21.98	50.31	64.97	**91.0**
50% betterment	l/s	11.0	25.2	32.5	**45.5**

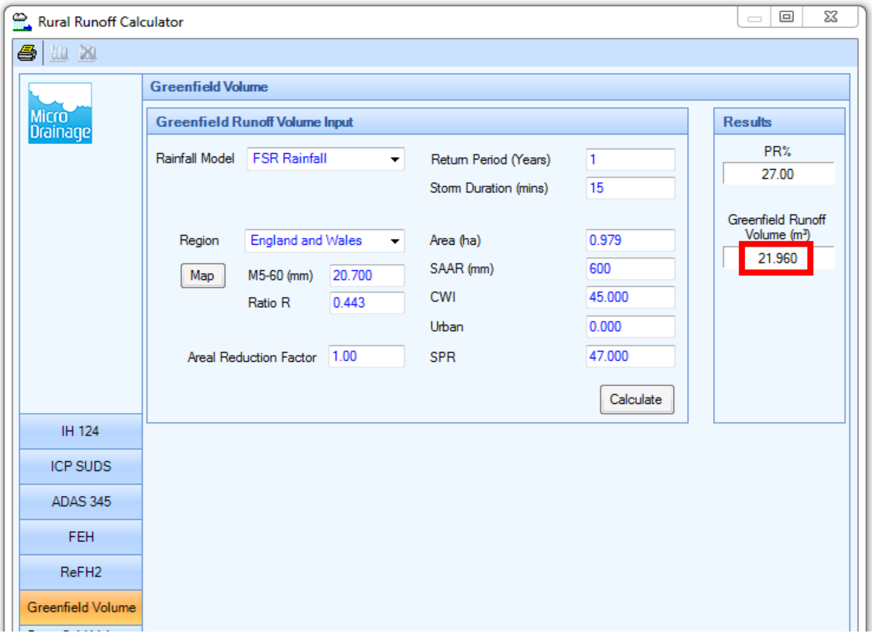


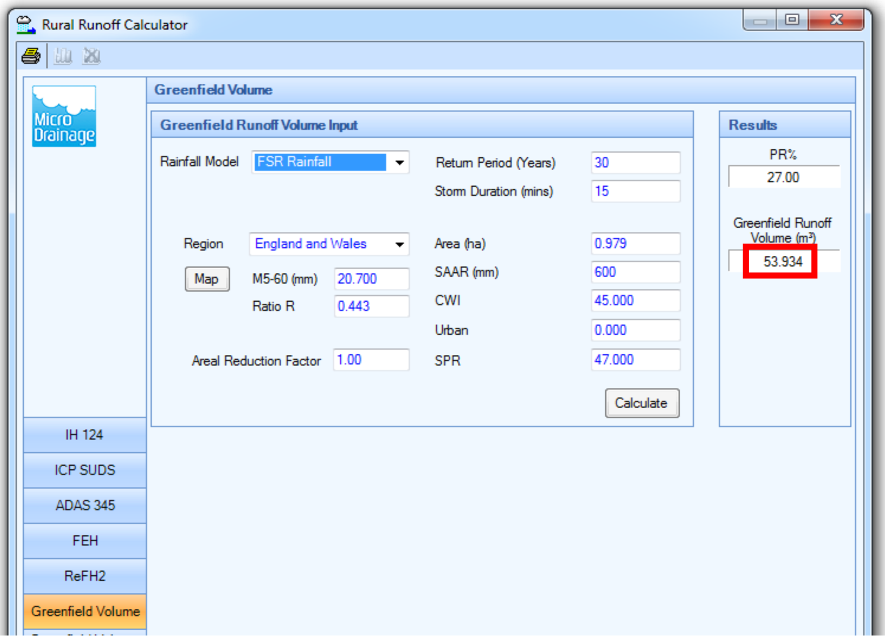
Greenfield Run Off Rate (IH124):

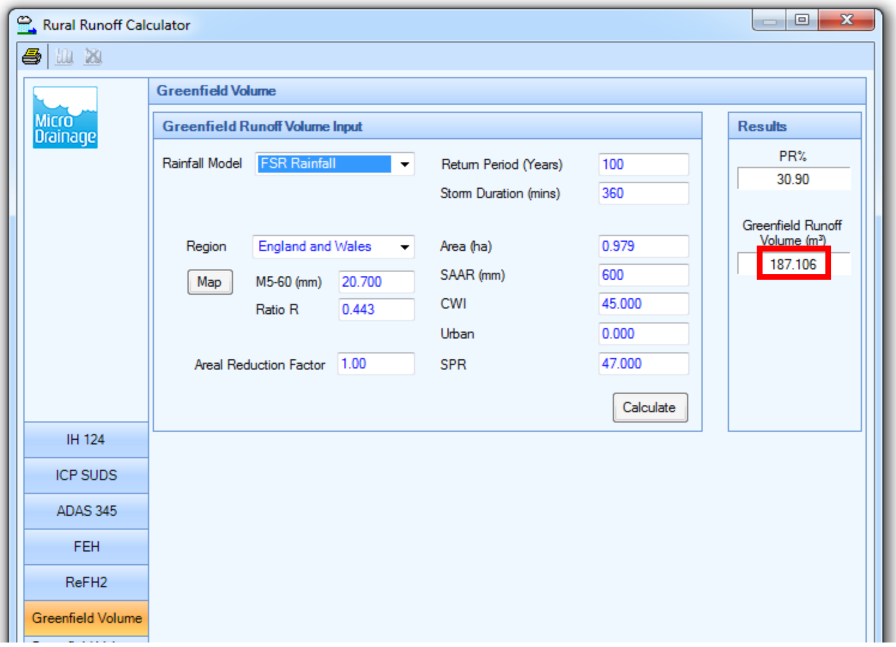
Qbar @ 50ha	183.4
Qbar (l/s/ha)	3.7
Site Qbar (l/s)	**2.7**

50% Reduction on existing	45.5	l/s
Greenfield for proposed	2.7	l/s
Total for site	**48.2**	**l/s**

Section 5 Evidence







Existing Run Off Volume

1 in 1

Summary of Results for 15 minute 1 year Winter I+0%

Pipe Number	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	2	15 minute 1 year Winter I+0%	20.000	18.137	-0.263	0.000	0.25		22.729	48.4	OK
2.000	2	15 minute 1 year Winter I+0%	20.000	18.137	-0.263	0.000	0.25		22.729	48.4	OK
3.000	3	15 minute 1 year Winter I+0%	20.000	18.137	-0.263	0.000	0.25		22.729	48.4	OK
1.001	3	15 minute 1 year Winter I+0%	20.000	17.853	-0.359	0.000	0.33		68.582	144.9	OK

1 in 30

Summary of Results for 15 minute 30 year Winter I+0%

Pipe Number	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	2	15 minute 30 year Winter I+0%	20.000	18.230	-0.170	0.000	0.62		55.902	119.1	OK
2.000	2	15 minute 30 year Winter I+0%	20.000	18.230	-0.170	0.000	0.62		55.902	119.1	OK
3.000	3	15 minute 30 year Winter I+0%	20.000	18.230	-0.170	0.000	0.62		55.902	119.1	OK
1.001	3	15 minute 30 year Winter I+0%	20.000	18.034	-0.178	0.000	0.82		167.788	356.5	OK

1 in 100 - 6 hour

Summary of Results for 360 minute 100 year Winter I+0%

Pipe Number	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	2	360 minute 100 year Winter I+0%	20.000	18.085	-0.315	0.000	0.10		169.374	19.8	OK
2.000	2	360 minute 100 year Winter I+0%	20.000	18.085	-0.315	0.000	0.10		169.374	19.8	OK
3.000	3	360 minute 100 year Winter I+0%	20.000	18.085	-0.315	0.000	0.10		169.374	19.8	OK
1.001	3	360 minute 100 year Winter I+0%	20.000	17.759	-0.453	0.000	0.14		508.134	59.5	OK

Network Details

Pipe Number	Pipe Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Time of Entry (mins)	Base Flow (l/s)	Pipe Rough. (mm)	US/IL (m)	US/CL (m)	Pipe DIA (mm)	Auto Design
1.000	15.000	0.188	79.8	0.326	5.00		0.600	18.000	20.000	400	
2.000	15.000	0.188	79.8	0.326	5.00		0.600	18.000	20.000	400	
3.000	15.000	0.188	79.8	0.326	5.00		0.600	18.000	20.000	400	
1.001	15.000	0.188	79.8	0.000			0.600	17.612	20.000	600	

Pipe Number	Rain (mm/hr)	TC (mins)	DS/IL (m)	Σ Imp. Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Pro. Vel (m/s)	Pro. Depth (mm)	Velocity (m/s)	Cap (l/s)	Flow (l/s)	Rain No.
1.000	50.00	5.12	17.812	0.326	0.0	0.0	0.0	1.58	109	2.11	265.7	44.1	1
2.000	50.00	5.12	17.812	0.326	0.0	0.0	0.0	1.58	109	2.11	265.7	44.1	1
3.000	50.00	5.12	17.812	0.326	0.0	0.0	0.0	1.58	109	2.11	265.7	44.1	1
1.001	50.00	5.21	17.424	0.978	0.0	0.0	0.0	2.07	167	2.73	771.3	132.4	1

Proposed Run Off Volume

1 in 1

Summary of Results for 15 minute 1 year Winter I+0%

Pipe Number	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
3.000	5	15 minute 1 year Winter I+0%	20.500	18.237	0.030	0.000	0.23		0.367	7.320	15.4	SURCHARGED
4.000	Dummy MH	15 minute 1 year Winter I+0%	21.600	21.484	-0.116	0.000	0.11		0.033	1.056	2.2	FLOOD RISK
4.001	BR Plot 3	15 minute 1 year Winter I+0%	21.500	21.375	-0.125	0.000	0.00		4.500	0.663	0.3	FLOOD RISK
4.002	1	15 minute 1 year Winter I+0%	20.500	20.009	-0.216	0.000	0.01		0.005	0.658	0.3	OK
5.000	10	15 minute 1 year Winter I+0%	20.500	20.066	-0.159	0.000	0.18		0.069	2.539	5.3	OK
4.003	TANK 02	15 minute 1 year Winter I+0%	20.500	18.646	-0.254	0.000	0.06		2.416	7.635	11.3	OK
3.001	6	15 minute 1 year Winter I+0%	20.500	18.234	0.124	0.000	0.46		1.839	17.192	28.0	SURCHARGED
3.002	7	15 minute 1 year Winter I+0%	20.500	18.226	0.166	0.000	0.47		1.136	18.775	29.1	SURCHARGED
6.000	Dummy MH	15 minute 1 year Winter I+0%	21.600	21.444	-0.156	0.000	0.20		0.073	4.281	9.0	FLOOD RISK
6.001	BR Plot 3	15 minute 1 year Winter I+0%	21.500	21.363	0.863	0.000	0.05		4.809	4.959	1.8	FLOOD RISK
6.002	4	15 minute 1 year Winter I+0%	20.500	20.056	-0.244	0.000	0.08		0.063	6.756	4.8	OK
6.003	TANK 01	15 minute 1 year Winter I+0%	20.500	18.621	-0.279	0.000	0.01		0.932	6.405	3.5	OK
3.003	9	15 minute 1 year Winter I+0%	20.500	18.216	0.065	0.000	0.14		1.595	30.974	36.0	SURCHARGED
7.000	10	15 minute 1 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
7.001	BR Plot 1	15 minute 1 year Winter I+0%	21.500	21.370	-0.130	0.000	0.00		1.545	0.410	0.2	FLOOD RISK
8.000	Dummy MH	15 minute 1 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
8.001	BR Plot 1	15 minute 1 year Winter I+0%	21.500	21.354	-0.146	0.000	0.02		1.033	5.326	5.6	FLOOD RISK
7.002	11	15 minute 1 year Winter I+0%	20.500	19.960	-0.390	0.000	0.04		0.063	8.188	10.0	OK
9.000	Dummy MH	15 minute 1 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
9.001	BR Plot 1	15 minute 1 year Winter I+0%	21.500	21.347	-0.153	0.000	0.02		0.288	4.058	5.9	FLOOD RISK
7.003	PP Plot 1	15 minute 1 year Winter I+0%	20.500	19.811	-0.375	0.000	0.07		0.149	12.513	15.9	OK
7.004	12	15 minute 1 year Winter I+0%	20.525	19.657	-0.347	0.000	0.12		0.209	14.378	19.1	OK
10.000	Dummy MH	15 minute 1 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
10.001	BR Plot 1	15 minute 1 year Winter I+0%	21.500	21.351	-0.149	0.000	0.02		0.294	3.991	5.7	FLOOD RISK
3.004	13	15 minute 1 year Winter I+0%	20.550	18.207	0.258	0.000	0.30		3.811	51.217	51.3	SURCHARGED
3.005	14	15 minute 1 year Winter I+0%	20.550	18.105	0.244	0.000	0.28		1.990	53.331	47.0	SURCHARGED
3.006	15	15 minute 1 year Winter I+0%	20.590	18.005	0.201	0.000	0.29		1.445	55.671	49.0	SURCHARGED
3.007	16	15 minute 1 year Winter I+0%	20.590	17.904	0.312	0.000	0.47		1.480	55.603	45.6	SURCHARGED

1 in 30

Summary of Results for 15 minute 30 year Winter I+0%

Pipe Number	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
3.000	5	15 minute 30 year Winter I+0%	20.500	19.193	0.986	0.000	0.60		1.448	17.957	40.5	SURCHARGED
4.000	Dummy MH	15 minute 30 year Winter I+0%	21.600	21.504	-0.096	0.000	0.28		0.056	2.593	5.5	FLOOD RISK
4.001	BR Plot 3	15 minute 30 year Winter I+0%	21.500	21.410	-0.090	0.000	0.02		10.740	3.104	1.2	FLOOD RISK
4.002	1	15 minute 30 year Winter I+0%	20.500	20.029	-0.196	0.000	0.04		0.027	3.074	1.2	OK
5.000	10	15 minute 30 year Winter I+0%	20.500	20.108	-0.117	0.000	0.46		0.117	6.235	13.2	OK
4.003	TANK 02	15 minute 30 year Winter I+0%	20.500	19.107	0.207	0.000	0.10		26.575	19.870	19.0	SURCHARGED
3.001	6	15 minute 30 year Winter I+0%	20.500	19.125	1.015	0.000	0.47		3.219	43.246	28.8	SURCHARGED
3.002	7	15 minute 30 year Winter I+0%	20.500	19.182	1.122	0.000	0.48		2.218	47.069	29.6	SURCHARGED
6.000	Dummy MH	15 minute 30 year Winter I+0%	21.600	21.489	-0.111	0.000	0.50		0.123	10.503	22.1	FLOOD RISK
6.001	BR Plot 3	15 minute 30 year Winter I+0%	21.500	21.394	0.894	0.000	0.07		14.064	6.795	2.2	FLOOD RISK
6.002	4	15 minute 30 year Winter I+0%	20.500	20.090	-0.210	0.000	0.20		0.105	11.165	12.1	OK
6.003	TANK 01	15 minute 30 year Winter I+0%	20.500	19.085	0.185	0.000	0.09		21.640	10.583	22.2	SURCHARGED
3.003	9	15 minute 30 year Winter I+0%	20.500	19.250	1.099	0.000	0.17		3.175	71.864	43.3	SURCHARGED
7.000	10	15 minute 30 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
7.001	BR Plot 1	15 minute 30 year Winter I+0%	21.500	21.397	-0.103	0.000	0.01		3.619	1.806	0.9	FLOOD RISK
8.000	Dummy MH	15 minute 30 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
8.001	BR Plot 1	15 minute 30 year Winter I+0%	21.500	21.384	-0.116	0.000	0.03		7.527	13.039	6.3	FLOOD RISK
7.002	11	15 minute 30 year Winter I+0%	20.500	19.990	-0.360	0.000	0.09		0.096	20.860	20.0	OK
9.000	Dummy MH	15 minute 30 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
9.001	BR Plot 1	15 minute 30 year Winter I+0%	21.500	21.385	-0.115	0.000	0.03		4.645	9.955	7.0	FLOOD RISK
7.003	PP Plot 1	15 minute 30 year Winter I+0%	20.500	19.864	-0.322	0.000	0.18		0.336	35.290	42.9	OK
7.004	12	15 minute 30 year Winter I+0%	20.525	19.732	-0.272	0.000	0.33		0.615	39.860	52.9	OK
10.000	Dummy MH	15 minute 30 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
10.001	BR Plot 1	15 minute 30 year Winter I+0%	21.500	21.389	-0.111	0.000	0.03		4.628	9.788	6.7	FLOOD RISK
3.004	13	15 minute 30 year Winter I+0%	20.550	19.382	1.433	0.000	0.41		5.140	126.090	70.2	SURCHARGED
3.005	14	15 minute 30 year Winter I+0%	20.550	19.422	1.561	0.000	0.39		3.480	131.259	65.3	SURCHARGED
3.006	15	15 minute 30 year Winter I+0%	20.590	19.434	1.630	0.000	0.36		3.061	136.980	60.9	SURCHARGED
3.007	16	15 minute 30 year Winter I+0%	20.590	19.432	1.840	0.000	0.49		3.208	136.829	47.1	SURCHARGED

1 in 100 - 6 hour

Summary of Results for 360 minute 100 year Winter I+0%

Pipe Number	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
3.000	5	360 minute 100 year Winter I+0%	20.500	18.377	0.170	0.000	0.09		0.526	54.388	6.2	SURCHARGED
4.000	Dummy MH	360 minute 100 year Winter I+0%	21.600	21.471	-0.129	0.000	0.05		0.018	7.848	0.9	FLOOD RISK
4.001	BR Plot 3	360 minute 100 year Winter I+0%	21.500	21.444	-0.056	0.000	0.04		16.764	32.964	2.5	FLOOD RISK
4.002	1	360 minute 100 year Winter I+0%	20.500	20.043	-0.182	0.000	0.08		0.043	32.972	2.5	OK
5.000	10	360 minute 100 year Winter I+0%	20.500	20.041	-0.184	0.000	0.08		0.041	18.875	2.2	OK
4.003	TANK 02	360 minute 100 year Winter I+0%	20.500	18.638	-0.262	0.000	0.04		2.002	85.331	7.9	OK
3.001	6	360 minute 100 year Winter I+0%	20.500	18.371	0.261	0.000	0.25		2.091	156.382	15.5	SURCHARGED
3.002	7	360 minute 100 year Winter I+0%	20.500	18.361	0.301	0.000	0.28		1.289	168.134	17.0	SURCHARGED
6.000	Dummy MH	360 minute 100 year Winter I+0%	21.600	21.420	-0.180	0.000	0.08		0.046	31.828	3.7	FLOOD RISK
6.001	BR Plot 3	360 minute 100 year Winter I+0%	21.500	21.413	0.913	0.000	0.07		19.503	48.503	2.5	FLOOD RISK
6.002	4	360 minute 100 year Winter I+0%	20.500	20.048	-0.252	0.000	0.06		0.053	62.026	3.8	OK
6.003	TANK 01	360 minute 100 year Winter I+0%	20.500	18.622	-0.278	0.000	0.02		0.992	62.019	3.7	OK
3.003	9	360 minute 100 year Winter I+0%	20.500	18.349	0.198	0.000	0.10		1.847	273.467	25.3	SURCHARGED
7.000	10	360 minute 100 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
7.001	BR Plot 1	360 minute 100 year Winter I+0%	21.500	21.405	-0.095	0.000	0.02		4.268	12.145	1.1	FLOOD RISK
8.000	Dummy MH	360 minute 100 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
8.001	BR Plot 1	360 minute 100 year Winter I+0%	21.500	21.324	-0.176	0.000	0.02		0.135	39.630	4.6	FLOOD RISK
7.002	11	360 minute 100 year Winter I+0%	20.500	19.954	-0.396	0.000	0.03		0.055	70.003	7.7	OK
9.000	Dummy MH	360 minute 100 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
9.001	BR Plot 1	360 minute 100 year Winter I+0%	21.500	21.299	-0.201	0.000	0.01		0.106	30.155	3.5	FLOOD RISK
7.003	PP Plot 1	360 minute 100 year Winter I+0%	20.500	19.805	-0.381	0.000	0.06		0.136	119.036	13.8	OK
7.004	12	360 minute 100 year Winter I+0%	20.525	19.647	-0.357	0.000	0.10		0.188	132.878	15.4	OK
10.000	Dummy MH	360 minute 100 year Winter I+0%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
10.001	BR Plot 1	360 minute 100 year Winter I+0%	21.500	21.300	-0.200	0.000	0.01		0.107	29.651	3.5	FLOOD RISK
3.004	13	360 minute 100 year Winter I+0%	20.550	18.340	0.391	0.000	0.27		3.960	450.167	45.7	SURCHARGED
3.005	14	360 minute 100 year Winter I+0%	20.550	18.237	0.376	0.000	0.28		2.140	466.112	47.2	SURCHARGED
3.006	15	360 minute 100 year Winter I+0%	20.590	18.135	0.331	0.000	0.28		1.592	483.691	46.7	SURCHARGED
3.007	16	360 minute 100 year Winter I+0%	20.590	18.033	0.441	0.000	0.48		1.625	$\boxed{483.586}$	46.6	SURCHARGED

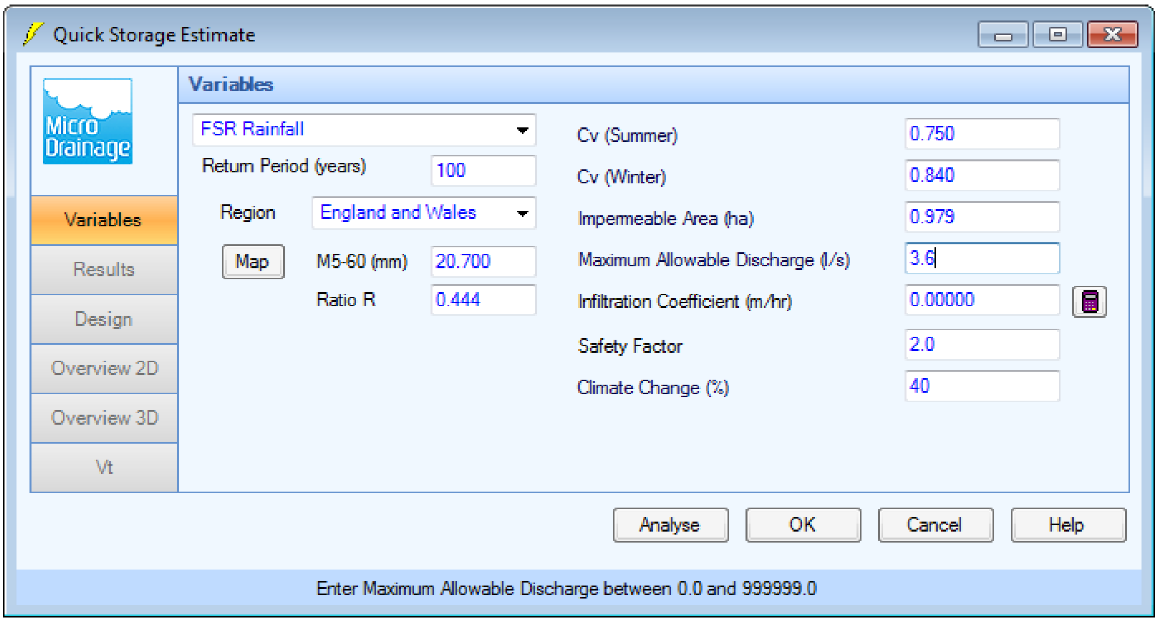
1 in 100 - 6 hour plus climate change

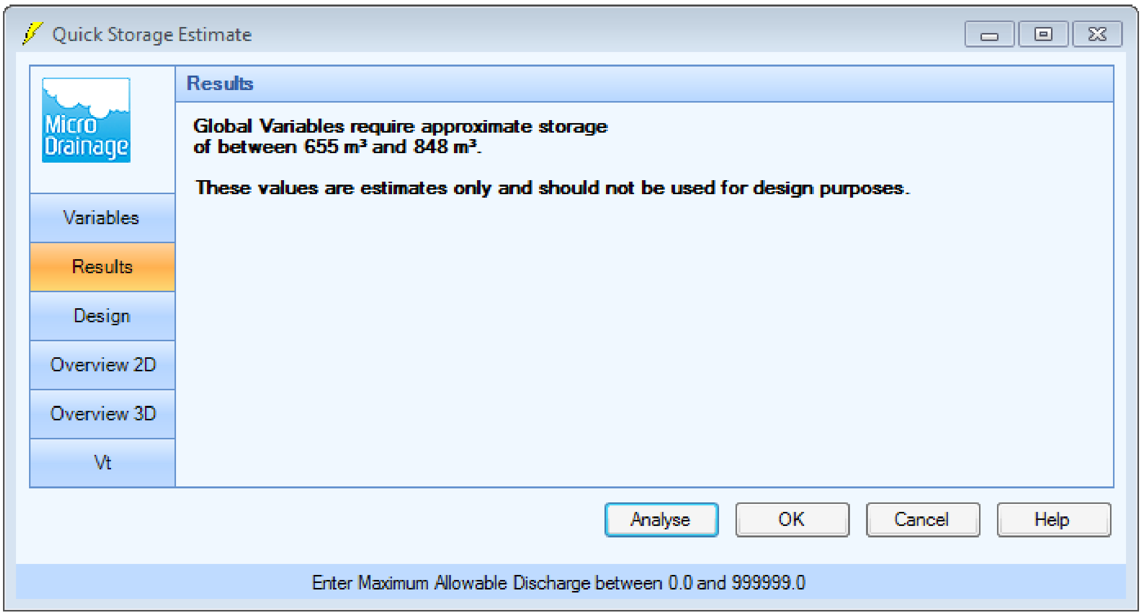
Summary of Results for 360 minute 100 year Winter I+40%

Pipe Number	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
3.000	5	360 minute 100 year Winter I+40%	20.500	19.326	1.119	0.000	0.13		1.600	76.162	8.7	SURCHARGED
4.000	Dummy MH	360 minute 100 year Winter I+40%	21.600	21.479	-0.121	0.000	0.06		0.027	10.986	1.3	FLOOD RISK
4.001	BR Plot 3	360 minute 100 year Winter I+40%	21.500	21.476	-0.024	0.000	0.05		22.625	47.106	3.3	FLOOD RISK
4.002	1	360 minute 100 year Winter I+40%	20.500	20.049	-0.176	0.000	0.11		0.050	47.117	3.3	OK
5.000	10	360 minute 100 year Winter I+40%	20.500	20.049	-0.176	0.000	0.11		0.050	26.423	3.1	OK
4.003	TANK 02	360 minute 100 year Winter I+40%	20.500	19.319	0.419	0.000	0.11		37.672	120.416	21.3	SURCHARGED
3.001	6	360 minute 100 year Winter I+40%	20.500	19.321	1.211	0.000	0.43		3.441	219.918	26.3	SURCHARGED
3.002	7	360 minute 100 year Winter I+40%	20.500	19.320	1.260	0.000	0.45		2.374	236.399	27.8	SURCHARGED
6.000	Dummy MH	360 minute 100 year Winter I+40%	21.600	21.458	-0.142	0.000	0.12		0.089	44.555	5.1	FLOOD RISK
6.001	BR Plot 3	360 minute 100 year Winter I+40%	21.500	21.456	0.956	0.000	0.09		32.018	68.618	2.9	FLOOD RISK
6.002	4	360 minute 100 year Winter I+40%	20.500	20.055	-0.245	0.000	0.08		0.061	87.555	4.7	OK
6.003	TANK 01	360 minute 100 year Winter I+40%	20.500	19.300	0.400	0.000	0.07		31.226	87.555	16.8	SURCHARGED
3.003	9	360 minute 100 year Winter I+40%	20.500	19.315	1.164	0.000	0.15		3.248	384.633	38.7	SURCHARGED
7.000	10	360 minute 100 year Winter I+40%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
7.001	BR Plot 1	360 minute 100 year Winter I+40%	21.500	21.420	-0.080	0.000	0.03		5.423	17.176	1.7	FLOOD RISK
8.000	Dummy MH	360 minute 100 year Winter I+40%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
8.001	BR Plot 1	360 minute 100 year Winter I+40%	21.500	21.357	-0.143	0.000	0.02		1.642	55.474	5.7	FLOOD RISK
7.002	11	360 minute 100 year Winter I+40%	20.500	19.960	-0.390	0.000	0.04		0.063	98.160	10.0	OK
9.000	Dummy MH	360 minute 100 year Winter I+40%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
9.001	BR Plot 1	360 minute 100 year Winter I+40%	21.500	21.324	-0.176	0.000	0.02		0.136	42.211	4.9	FLOOD RISK
7.003	PP Plot 1	360 minute 100 year Winter I+40%	20.500	19.818	-0.368	0.000	0.08		0.164	167.843	18.4	OK
7.004	12	360 minute 100 year Winter I+40%	20.525	19.661	-0.343	0.000	0.13		0.223	187.211	20.7	OK
10.000	Dummy MH	360 minute 100 year Winter I+40%	21.600	21.450	-0.150	0.000	0.00		0.000	0.000	0.0	OK
10.001	BR Plot 1	360 minute 100 year Winter I+40%	21.500	21.326	-0.174	0.000	0.02		0.137	41.506	4.9	FLOOD RISK
3.004	13	360 minute 100 year Winter I+40%	20.550	19.324	1.375	0.000	0.33		5.074	633.236	55.1	SURCHARGED
3.005	14	360 minute 100 year Winter I+40%	20.550	19.322	1.461	0.000	0.32		3.366	655.614	54.0	SURCHARGED
3.006	15	360 minute 100 year Winter I+40%	20.590	19.318	1.514	0.000	0.31		2.930	680.267	51.9	SURCHARGED
3.007	16	360 minute 100 year Winter I+40%	20.590	19.313	1.721	0.000	0.49		3.073	$\boxed{680.161}$	47.1	SURCHARGED

Section 6 Evidence

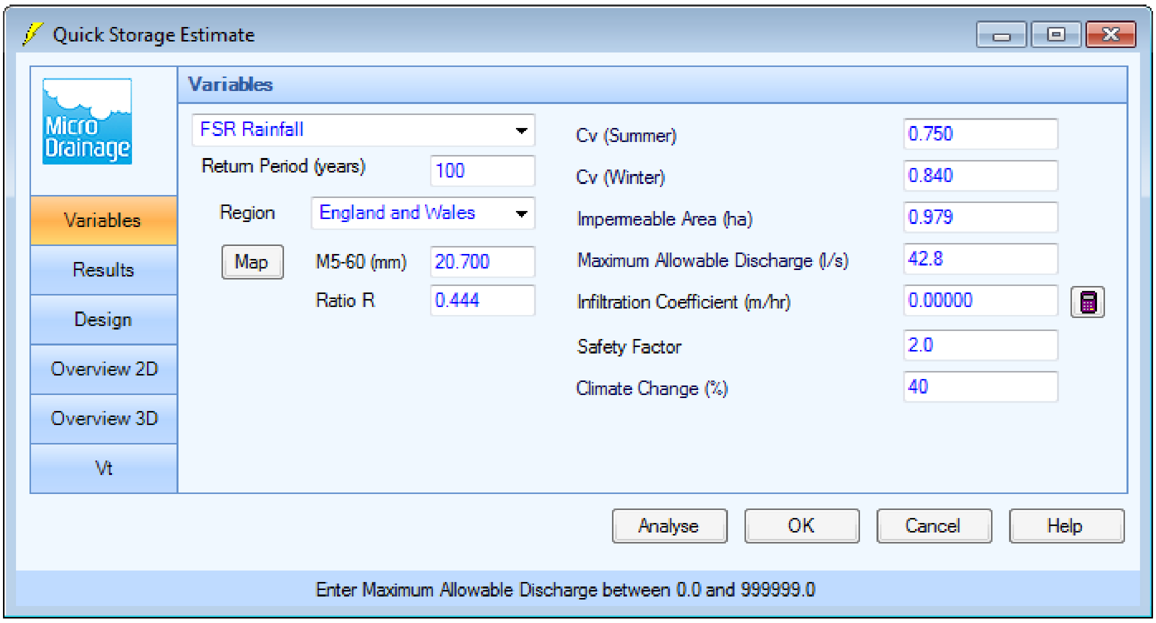
Greenfield Attenuation

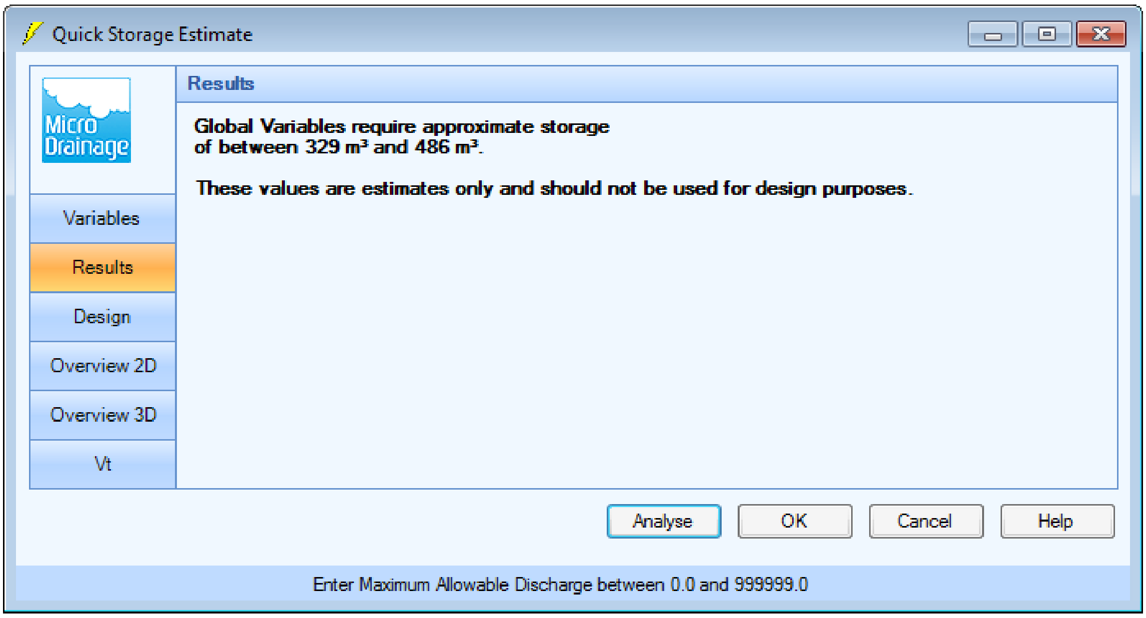




Average = 752 m^3

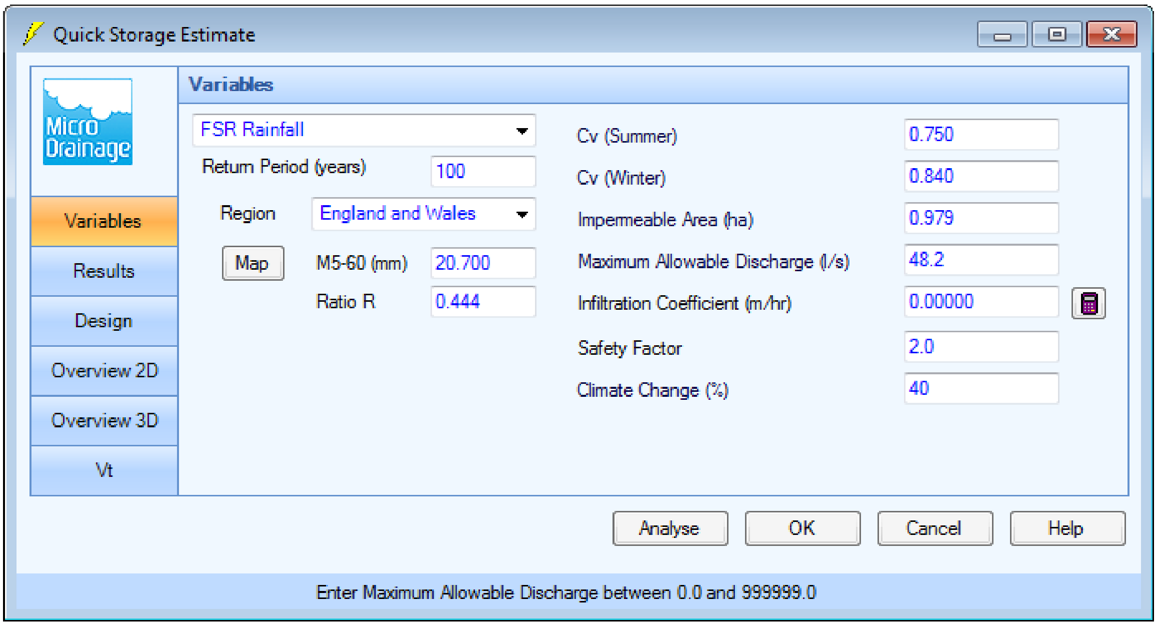
50% Betterment Attenuation

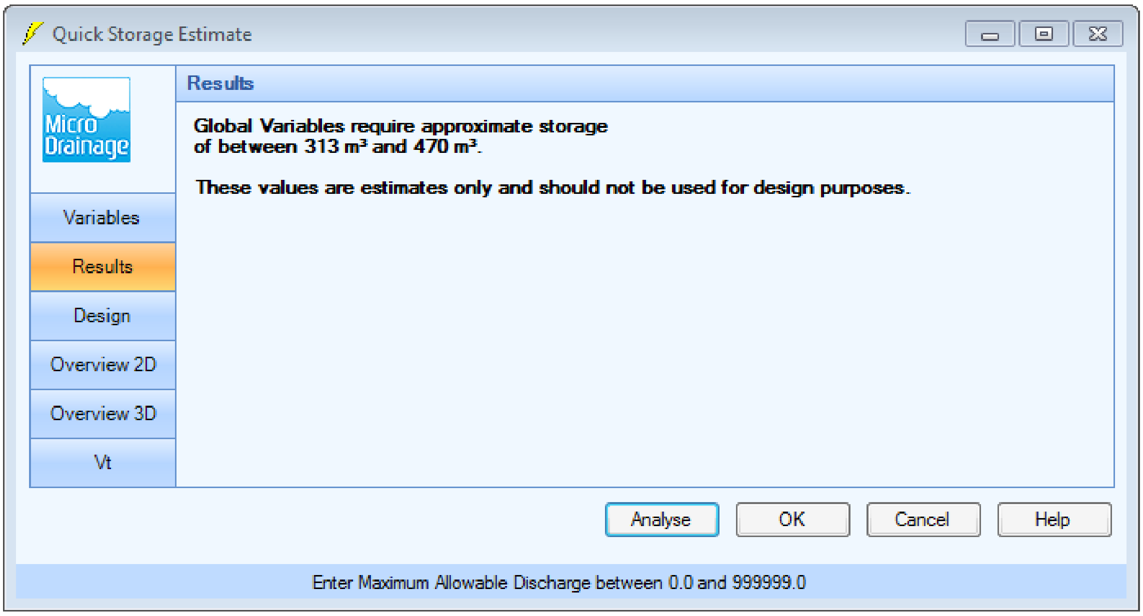




Average = **408 m^3**

Proposed Attenuation



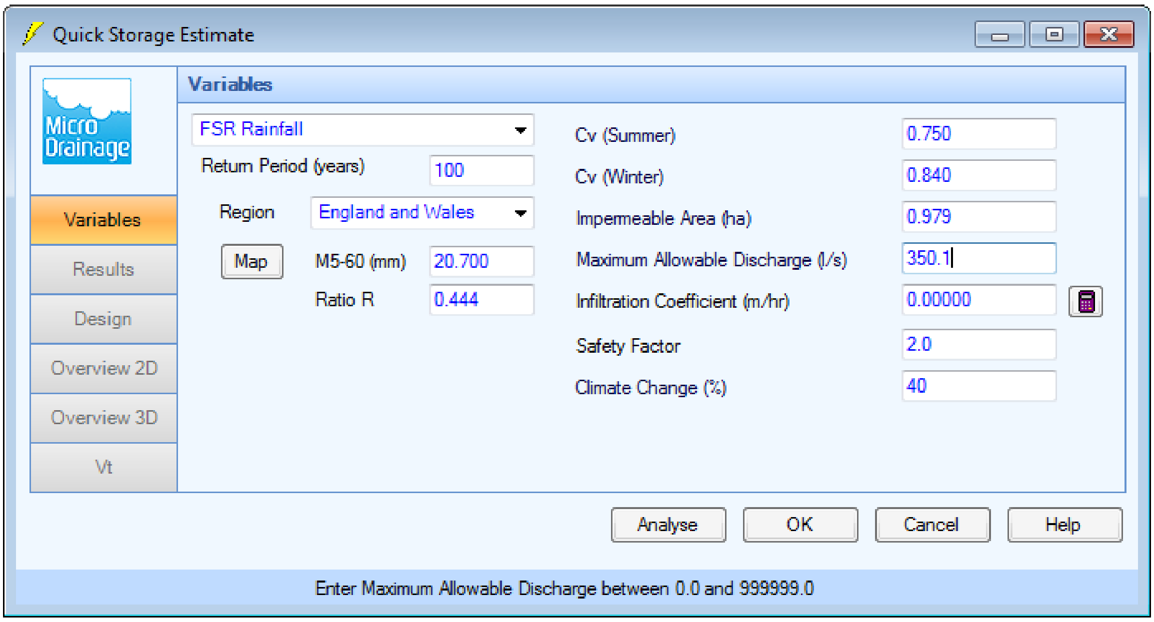


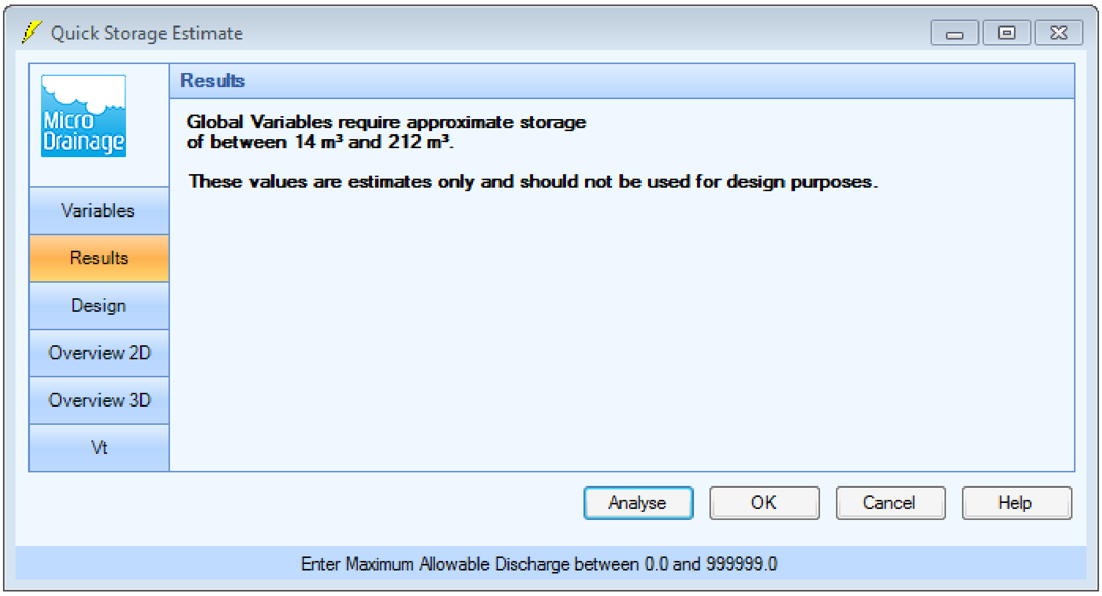
Average = 392 m^3

Refer to drainage philosphy document for discharge rate calculation details.

Combination of greenfield and 50% betterment recevied AIP.

Existing Attenuation





Average = **113 m^3**

APPENDIX 6
MEETING MINUTES AND CORRESPONDANCE

Mr Alexander Livington
Ramboll UK Ltd
240 Blackfriars Road
London
SE1 8NW

Wastewater pre-planning

Our ref DS6051702

18 June 2020

Pre-planning enquiry: Confirmation of sufficient capacity

Dear Mr Livington,

Thank you for providing information on your development:

256 Gray's Inn Road, London, WC1X 8LD

Existing: Commercial unit (No details available).

Existing surface water discharge at 1 year = 73.1l/s, 30 year = 179.5 l/s and 100 year = 231.9l/s.

Proposed: Offices unit (Laboratory, Plot 1, 2 & 3 15,796m2). Foul and surface water to discharge by gravity into the combined 1143mmx762mm sewer.

Proposed surface water discharge at Qbar = 2.7l/s for new build plots 1 & 3. Plot 2 to be refurbished and 50% betterment to be provided with the following discharge rates: 1 year = 10.2l/s, 30 year =25.2l/s, 100 year = 32.5l/s and 100 year +40%CC = 45.5l/s. Maximum total surface water discharge = 48.2l/s.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent combined sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

Please note that discharging surface water to the public sewer network should only be considered after all other methods of disposal have been investigated and proven to not be viable. In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being: 1st Soakaways; 2nd Watercourses; 3rd Sewers.

Only when it can be proven that soakage into the ground or a connection into an adjacent watercourse is not possible would we consider a restricted discharge into the public combined sewer network.

If the peak surface water run-off discharge is then restricted to Greenfield run-off rates/a maximum of 2.7l/s for plots 1 & 3 and 50% betterment for the refurbished plot 2 as your drainage strategy indicates, then we would have no objections to the proposals.

Thames Water Planning team would ask to see why it is not practicable on the site to restrict to Greenfield run-off rates if they are consulted as part of any planning application.

In considering your surface water needs, we support the use of sustainable drainage on development sites. You'll need to show the local authority and/or lead local flood authority how you've taken into account the surface water hierarchy that we've included.

Please see the attached 'Planning your wastewater' leaflet for additional information.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 0203 577 9811

Yours sincerely

Siva Rajaratnam – Adoptions Engineer

Thames Water

Planning your wastewater

We've put together some information on sewerage to help you plan your new development.

How long does it take to get consent to connect to a sewer?

If you're applying for consent to connect to a sewer under Section 106 of the Water Industry Act 1991, you'll need to give us 21 days' notice.

I think I'll need to connect to a trunk sewer – is that possible?

Connecting directly to trunk sewers can be complex and dangerous, and we won't permit this at all in London. If you're considering a trunk sewer as a point of connection, please contact us as soon as possible to discuss.

How do I handle trade effluent and groundwater discharges?

You mustn't discharge non-domestic waste to our sewers without a valid trade effluent consent - doing this is an offence under Section 109(1) of the Water Industry Act 1991. You can call our trade effluent team on 0203 577 9200 to get help with trade effluent consents and ground water discharge permits.

Where can I discharge surface water?

The Lead Local Flood Authority, or if you are in a London Borough, 'The London Plan', advises that your development should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so. You should aim to achieve greenfield run-off rates and ensure you manage surface water run-off 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 or drain.
7. Discharge rainwater to a combined sewer.

Please note that if you're discharging surface water anywhere other than to a public sewer – such as to a watercourse – you'll need approval from the relevant authority, for example the Environment Agency, the local authority or the Canals and Rivers Trust.

If you don't follow the surface water hierarchy you may not be granted planning permission, and Thames Water may seek to put conditions on the planning application.

There's no right of discharge of highway drainage into the public sewerage system, and we'd need to agree this with the relevant highway authority under Section 115 of the Water Industry Act 1991. You can contact us to discuss this further.

What can I do about redundant sewers and rising mains on my site?

On brownfield sites where existing sewers or rising mains need to be made redundant or diverted, the developer will need to fund the work, as set out in Section 185 of the Water Industry Act. If there's no practical way of making a diversion, we'll apply the standoff distances in Sewers for Adoption 7th edition to assess the width of easement required.

APPENDIX 7
SUDS MANAGEMENT AND MAINTENANCE REGIME

Intended for
UCL

Document type
REPORT

Date
March, 2019

UCL
SUDS MAINTENANCE SCHEDULE

UCL
SUDS MAINTENANCE SCHEDULE

Contents

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1. MANAGEMENT AND MAINTENANCE OVERVIEW

1.1 Overview

The proposed catchment for the UCL – IoN / DRI will drain to Gray's Inn Road, and will pass through the proposed SuDS features such as blue roofs, permeable pavements and below ground storage tanks prior to discharge into the existing sewer owed by Thames Water. For further details, please refer to the drainage philosophy report and drawing BEMP-RAM-P1-00-DR-C-0100, 0101, 0102 and 0103.

This document will establish the basis of the maintenance schedule for the proposed SuDS features.

1.2 Proposed Management Teams

The proposed SuDS features are to be maintained by a suitable management company following completion of the development.

1.3 Management Processes

Management procedures will be developed in accordance with the guidance contained in CIRIA C753 "The SuDS Manual" and CIRIA C625 "Model agreements for sustainable water management systems".

The Model Agreements for Sustainable Water Management Systems published by CIRIA has been used as guidance for establishing the maintenance regime for this site. It is anticipated that the maintenance will be carried out by an appropriate maintenance body. Therefore, it is suggested that the model agreement 'Private SUDS Model Agreement – SUDS MA3' is used.

Should the maintenance be transferred at a later date to a public body, then model agreement SUDS MA1 should be used, details of which can be found in the CIRIA guidance C625. This will assist in complying with the Water Framework Directive and the Flood and Water Management Act.

The below schedules outline the main maintenance obligations for the proposed SuDS features.

2. SCHEDULE 1 – GREEN/BLUE ROOFS

This feature is primarily designed to capture, convey and treat overland flows prior to passing from the roof to the main network.

All maintenance activities should be carried out in accordance with the constraints applicable at the time (i.e. nesting / migration etc.).

Activity	Tasks Required
Regular maintenance	• 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 rain 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
Occasional/Remedial 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 (ie year one), replace dead plants as required • Post establishment, replace dead plant as required; 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 grass, prunes shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate; six monthly or as required • 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
Monitoring	N/A

3. SCHEDULE 2 – PERVIOUS PAVEMENT

This feature is primarily designed to capture, convey and treat overland flows prior to passing from the sensory garden to the main network.

All maintenance activities should be carried out in accordance with the constraints applicable at the time.

Activity	Tasks Required
Regular maintenance	• Brushing and vacuuming three times/year at the end of winter, mid-summer, after autumn leaf fall, or as required on site-specific observations of clogging or manufacturer recommendation
Occasional/Remedial Maintenance	• Stabilise and mow contributing and adjacent areas, as required • Removal of week, as required • 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 structural performance or a hazard to users, as required • Rehabilitation of surface and upper sub-structure, as required
Monitoring	• Initial inspection, monthly for 3 months after installation. • Inspect for evidence of poor operation and/or weed growth/ Of required take remedial action, 3 monthly, 48hrs after large storms • Inspect silt accumulation rates and establish appropriate brushing frequencies, annually • Monitor inspection chambers, annually

4. SCHEDULE 3 – STORAGE TANKS

This feature is primarily designed to store and convey surface water prior to passing from the hard-standing areas around the courtyard of Plot 2 and Plot 3 to the main network.

All maintenance activities should be carried out in accordance with the constraints applicable at the time.

Activity	Tasks Required
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 structure and/or internal forebays; annually or as required
Occasional/Remedial Maintenance	• 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 • Survey inside of tank for sediment build-up and remove if necessary; every 5 years or as required

5. SCHEDULE 4 – MANHOLES

This feature is primarily designed to convey overland from the hard-standing areas to the SuDS features and then to existing sewer.

All maintenance activities should be carried out in accordance with the constraints applicable at the time.

Activity	Tasks Required
Regular maintenance	• Check for accumulation of debris and silt and cleaned as necessary • Covers and frames to be checked for damage. • Exposed concrete and adjacent surfacing to be checked for cracking and general damage. • Check condition of inlet and outlet pipes, flow controls, baffles and isolation structures
Occasional/Remedial Maintenance	• Clean as necessary. • All manhole and inspection chamber covers and frames to be replaced as necessary. • Repair exposed concrete and surfacing as necessary • Repair/rehabilitation of inlets, outlet, overflows and vents, as required.
Monitoring	• Inspect every 6 months or after large storm.

APPENDIX 8
SUDS HIERARCHY TABLE

SuDS hierarchy

Priority	SuDS Method	Proposed Use in Development	Flood	Pollution & Wildlife benefit
1	Green/Brown/Blue Roofs	**Proposed** to be used on some sections of the roof. The roof area covers a significant proportion of the site and effectively could be treated as a green / blue roof.	√	√
2	Store Rainwater for later use	**Scope** to reuse of water for irrigation. MEP engineer to develop. This does not affect the attenuation calculations, as it is likely that this will be connected to mains water.	√	X
3	Use Infiltration techniques	**Not possible** to infiltrate due to proximity to grade listed buildings and ground conditions.	√	√
4	Filter strips such as 'French Drains' and 'Rain Gardens'	**Proposed** within the lightwell gardens. To be developed with Landscape Architect proposals.	√	√
5	Ponds or Open Water Features for Gradual Release to Watercourse	**Not possible** to proposed Ponds due to the building footprint and nature of the site.	√	√
6	Attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse	**Proposed** use attenuation storage for gradual release to a piped network utilised, which shall be cellular tanks below soft/hard landscaping /in-situ tanks below the building or in open spaces.	√	Limited
7	Discharge rainwater direct to a watercourse	**Not possible** owing to site location.	X	X
8	Discharge rainwater to a surface water drain	**Not possible**. Local public drainage network consists of only combined sewers	X	X
9	Discharge rainwater to a combined sewer.	**Proposed.** The sewer running adjacent to the site is a combined sewer and will be the likely discharge connection point. Networks will be kept separate until discharge point.	N/A	N/A