

DRAINAGE STRATEGY ADDENDUM

1 Ferdinand Place, London, NW1 8EE

for

Leverton & Sons

August 2016

V2.0

stilwell-ltd.co.uk

Ferdinand Place, London, NW1 8EE

for

Leverton & Sons

P2875	Drainage Strategy Addendum, Ferdinand Place, London, NW1 8EE

Revision	Date of issue	Comments	Prepared By	Checked By
1.0	22/08/2016	First Issue	EB	AJ
2.0	23/08/2016	Minor Updates	AJ	DB

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1.0 Introduction

1.1 Leverton & Sons has submitted a Planning Application for a development on the site at Ferdinand Place, London, NW1 8EE.

1.2 Comments on the submitted Drainage Strategy were returned by Camden Council on 14th June 2016 and are included in **Appendix A**.

1.3 The comments raised the following issues for the development:

- Flood Risk Assessment not provided
- Surface Water Flooding Risk
- Restriction of Flow and Attenuation to Provide 50% Reduction Rate as per the London Plan
- Drainage Hierarchy not addressed
- Rainwater Harvesting not addressed.

1.4 This Drainage Strategy Addendum aims to address all the points raised above. These points were considered as part of the original report but not explicitly stated.

1.5 The general limitation of this assessment are that:

- A number of data sources have been used in compiling this report. Whilst The Stilwell Partnership (TSP) believe them to be trustworthy; it is unable to guarantee the accuracy of the information that has been provided by others.
- This report is based on information available at the time of preparation. There is potential for further information to become available, which may create a need to modify conclusions drawn in this report.

2.0 Location of Site

2.1 The site is located at Ferdinand Place, London, NW1 8EE. A Site Location Plan is found at **Appendix A**.

2.2 The Local Authority is the London Borough of Camden (LBC).

3.0 Comments

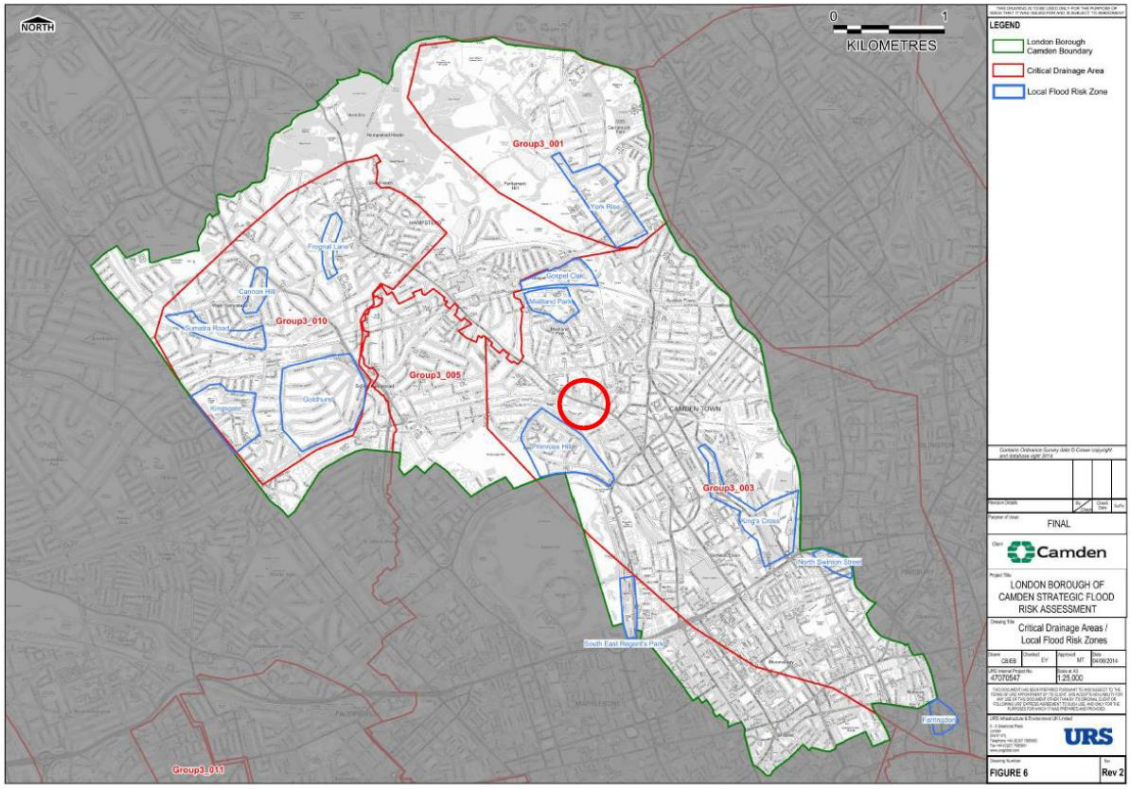
Flood Risk Assessment

3.1 Camden Council in their response stated that a Flood Risk Assessment was not submitted as part of the Application and that a Flood Risk Assessment (FRA) was required.

3.2 This was reviewed against NPPF and Local Policy. The existing site is less than 1 hectare in size and is in Flood Zone 1. Therefore, a Flood Risk Assessment is not required by NPPF. All forms of flooding were assessed as part of the drainage strategy.

3.3 The Camden response also highlighted the lack of reference to critical drainage areas in the report. The map above indicates the site does lie within a critical drainage area (marked red).

Location of development relative to Local Flood Risk Zone:



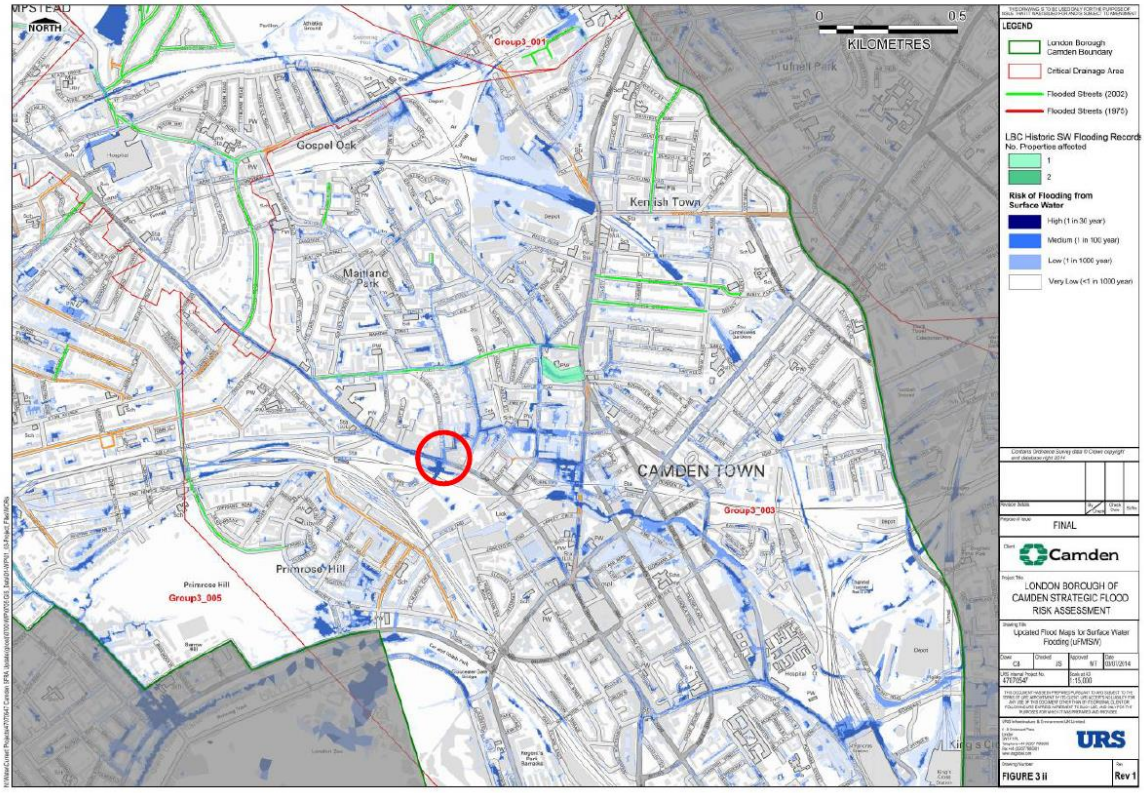
3.4 The Camden SFRA indicates that a site within a critical drainage area is not necessarily at greater risk than one outside, but any undeveloped land should be considered as detrimental to the area.

3.5 The site is not only previously developed and 100% hardstanding, it has been shown to not be at risk from any forms of flooding. Therefore the fact it is within a critical drainage area should not impact the site development potential.

Surface Water Flooding Risk

3.6 Camden Council in their response stated that "The SFRA maps [shown below] indicate the site is at risk of surface water flooding (1/100 year event) with sites nearby at risk of flooding in the 1/30 year storm event. Therefore the development should seek to reduce surface water run off to Greenfield or 50% existing to minimise risk on site and downstream."

Location of development relative to surface water flood risk:



3.7 The surface water flood risk is localised to the adjacent roads and does not appear to encroach the site boundary. This is reflected in the Camden mapping. Therefore, the risk to the development area is considered minimal.

Restriction of Flow / Attenuation

3.8 Camden Council in their response stated that there is a need for "Major developments to achieve greenfield run-off rates wherever feasible and as a minimum 50% reduction in run off rates" and "NPPF requires all major developments to include SuDS unless demonstrated to be inappropriate (as set out in the Ministerial Statement by the Secretary of State on 18 December 2014)."

3.9 It should be noted that the London Plan requests a reduction in run-off be applied if viable for the development. Compliance with this would require the implementation of a new flow control manhole and attenuation system to be constructed below basement floor level so as to restrict the volume of water entering the existing sewer.

3.10 In addition, compliance with this policy would also require that the existing rainwater pipe connections be abandoned, with the roof water being redirected to the basement level. This is to enable the rainwater to enter the new flow restriction and attenuation devices, controlling the water from site.

3.11 Therefore, it is not recommended from a technical viewpoint that the London Plan is enforced for this development. Providing a 50% flow reduction on a site with such spatial and level constraints will significantly increase the complexity, redundancy, risk and cost in the design.

3.12 As all the surface water would be draining to the basement and a new attenuation system, the design is relying entirely on this system being functional, creating a risk of basement flooding if the system should fail or block. The existing rainwater pipes discharge freely into the sewer and so do not have this issue, should they be re-used.

3.13 In addition, there would be very complex and costly maintenance implications should a new attenuation and flow control system be implemented under basement level. It is expected that all new excavation and construction would require dewatering and tanking under the guidance of a chartered structural engineer.

3.14 As the existing hardstanding areas are being retained, it is considered appropriate to discharge freely into the combined sewer via the basement and the existing rainwater pipe connections.

Drainage Hierarchy

3.15 Camden Council in their response stated that the "Development should follow the drainage hierarchy in policy 5.13 of the London Plan below:

- Store rainwater for later use
- Use infiltration techniques, such as porous surfaces in non-clay areas
- Attenuate rainwater in ponds or open water features for gradual release.
- Attenuate rainwater by storing in tanks or sealed water features for gradual release
- Discharge rainwater direct to a watercourse
- Discharge rainwater to a surface water sewer/drain
- Discharge rainwater to the combined sewer".

3.16 The drainage & SUD's hierarchy has been considered fully for this development, as has the London plan as mentioned above. In addition, the Council Pro-Forma has been completed and can be found at **Appendix C**.

3.17 Initial ground investigations (desk study) indicate infiltration is not viable & groundwater is likely to be encountered. There are no viable external areas to implement surface based SuDs services.

3.18 In addition, there are no surface water sewers or watercourses in the area so the combined sewer is the most appropriate discharge point.

Rainwater Harvesting

3.19 Communications with the design team and planners highlighted that further information was required on the viability of rainwater harvesting for the site.

3.20 The rainwater re-use needed for the development has been assessed in line with Environment Agency and STROMA (who provide a certification scheme) guidance.

3.21 There are no external gardens on the development so rainwater harvesting and water butts are only appropriate for grey water re-use.

3.22 On that basis, water butts can be instantly discounted for the development.

3.23 In order to calculate the tank size needed for the development (using an online calculator), the following roof areas were used:

- Site A (Funeral home): 615m^2
- Site B (Flats): 310m^2
- Using a residential roof area of 310m^2 and using the fact it is a 4 storey building (Class C3) with 19 residential units (5x 1-bed, 8 x 2bed and 6 x 3 bed units). A total of 39 bedrooms were counted on the floor plans.

The Funeral Home

3.24 The funeral home has an average occupancy of 10 persons (conservative) and minimal grey water requirement. The online calculator indicates that there is no viable volume of water required in a harvester and so this can be discounted.

3.25 The flats have 39 bedrooms and a standard grey water requirement. The online calculator returns a null result due to lack of rainwater, as shown in **Appendix B**.

3.26 Therefore, due to the lack of water demand in the funeral home, and lack of roof area in the flats, rainwater harvesting is not viable for the site.

4.0 Summary and Conclusions

4.1 Leverton & Sons have submitted a Planning Application for a proposed development at Ferdinand Place, London, NW1 8EE.

4.2 Comments on the submitted Drainage Strategy were returned by Camden Council on 14th June 2016.

4.3 The comments raised the following issues for the development:

- Flood Risk Assessment not provided
- Surface Water Flooding Risk
- Restriction of Flow and Attenuation to Provide 50% Reduction Rate as per the London Plan
- Drainage Hierarchy not addressed
- Rainwater Harvesting not addressed.

4.4 This report has addressed all the comments from Camden Council.

Appendix A

Comments – London Borough of Camden

Lead Local Flood Authority – London Borough of Camden
Statutory Consultee for all Major Developments (SuDS)
Statutory Consultee for all Major developments >1ha

Scheme Address	1-3,4,6,8 Ferdinand Place
Planning Reference	2016/2457/P
Size of site (as stated on application form)	0.0615Ha + 0.0310Ha
Date	14/06/2016
Recommendation:	Refuse until further information is provided

Description of Development:

Demolition of existing buildings and erection of new buildings to provide replacement funeral directory facility at ground and basement levels of 4-8 Ferdinand Place. Provision of nineteen Class C3 residential units (5 x 1-bed, 8 x 2-bed and 6 x 3-bed units), split across eight units provided at first, second and third floor levels at 4-8 Ferdinand Place and eleven units at ground to fourth floor level at 1-3 Ferdinand Street.

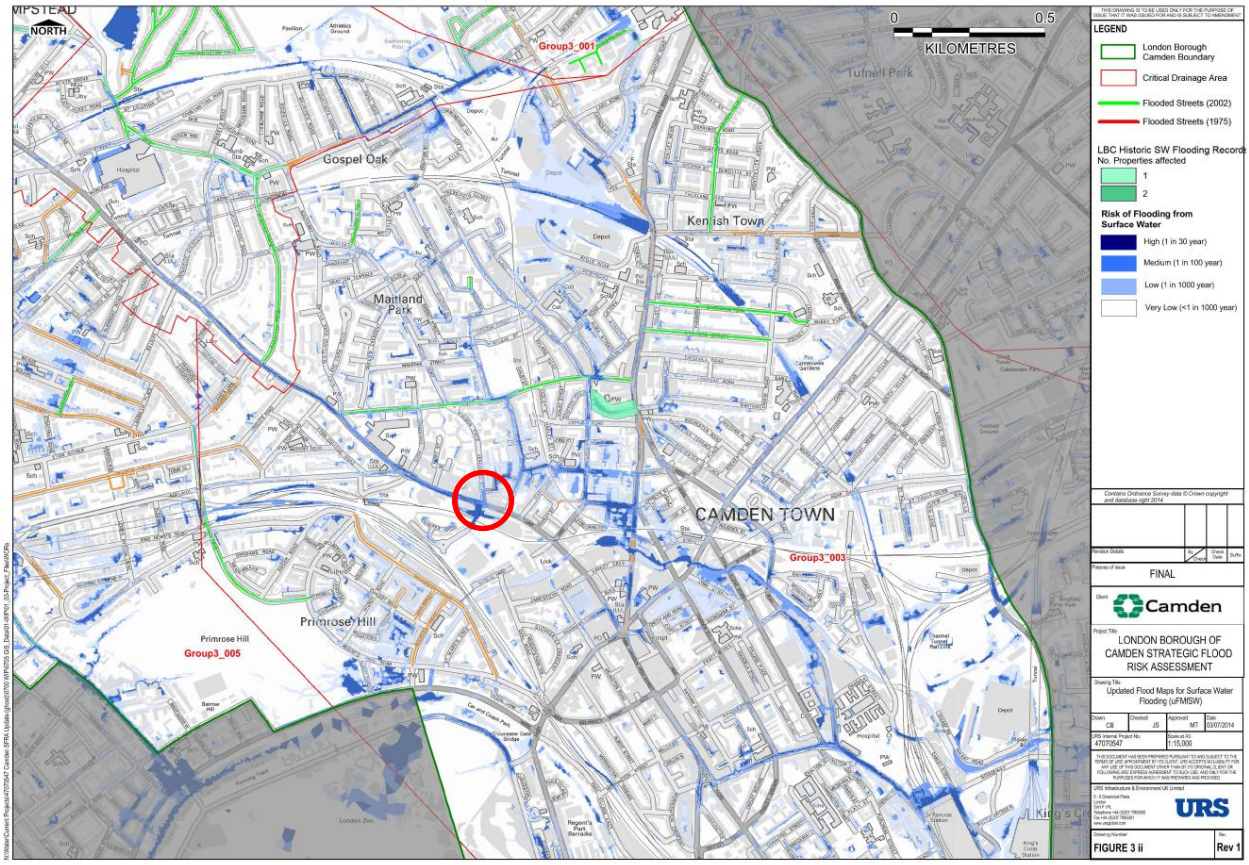
Policy Requirement:

- Submit an FRA if >1ha
- Major developments to achieve greenfield run-off rates wherever feasible and as a minimum 50% reduction in run off rates.
- NPPF requires all major developments to include SuDS unless demonstrated to be inappropriate (as set out in the Ministerial Statement by the Secretary of State on 18 December 2014).
- Development should follow the drainage hierarchy in policy 5.13 of the London Plan below:
    - store rainwater for later use
    - use infiltration techniques, such as porous surfaces in non-clay areas
    - attenuate rainwater in ponds or open water features for gradual release
    - attenuate rainwater by storing in tanks or sealed water features for gradual release
    - discharge rainwater direct to a watercourse
    - discharge rainwater to a surface water sewer/drain
    - discharge rainwater to the combined sewer
- Developments in areas known to be at risk of surface water flooding are designed to cope with being flooded.

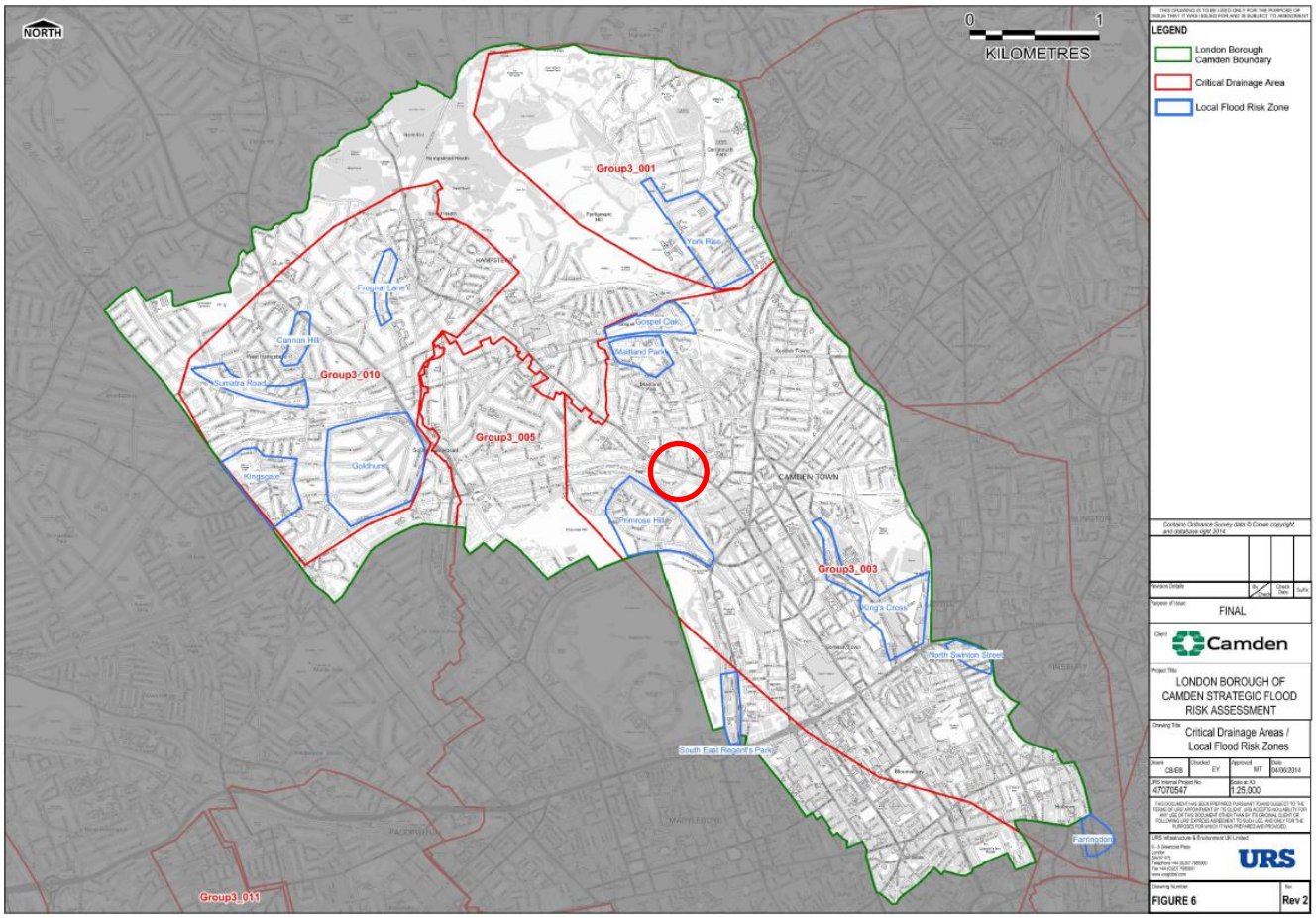
Best practice guidance recommended within the non-statutory technical standards:

- Constrain off volumes to greenfield run off volumes for the 1 in 100 year 6 hour event.

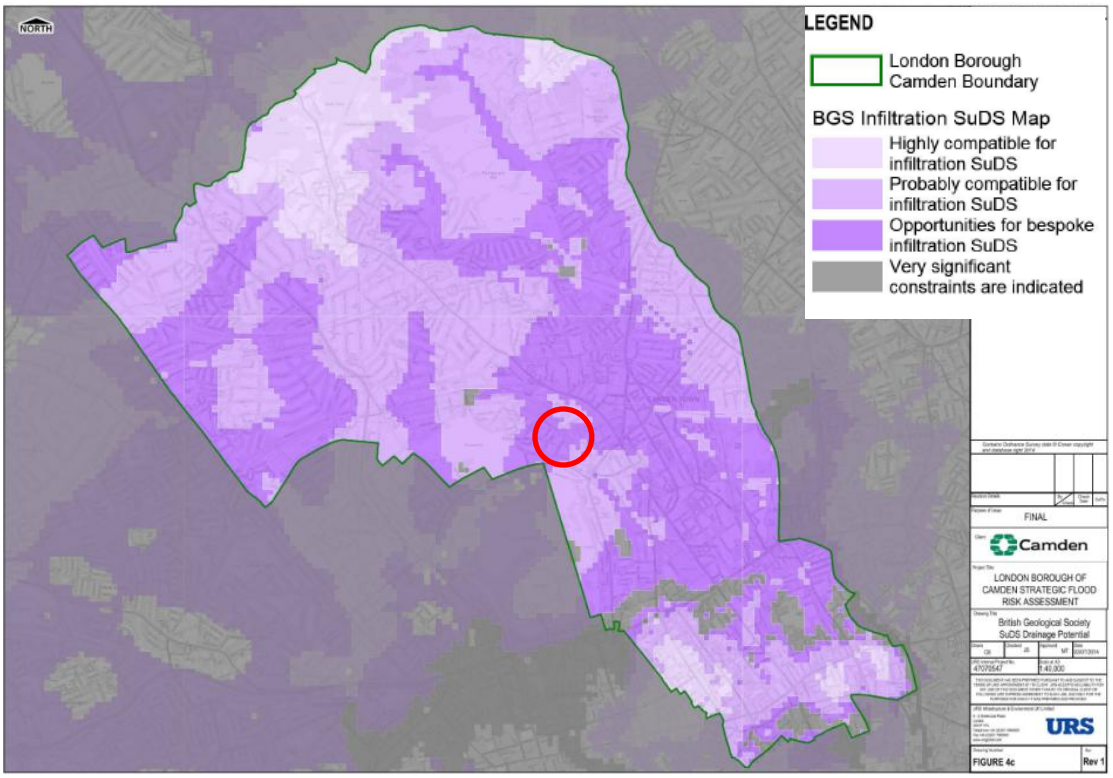
Location of development relative to surface water flood risk:



Location of development relative to Local Flood Risk Zone:



Location of development relative to infiltration compatibility:



Documents submitted (✓ = YES, × = NO):

- ✓ Surface water drainage statement

X Drawings showing details of SuDS extent and position
X Completed drainage proforma
X SuDs maintenance

Proposed SuDS:

None – using existing storm drains.

Greenfield, Existing and Proposed Run off rates:

Site A: 1/1 existing and proposed = 12.16 l/s

Site B: 1/1 existing and proposed = 6.13 l/s

Proposals are to restrict to existing run-off.

Proposed volume of water attenuated

To restrict run-off from 1/100+CC storm to existing levels, storage requirements are as follows:

Site A: 13.78m³

Site B: 6.89m³.

Policy compliance and Further information required

Submit an FRA if >1ha

Comment: Development is <1 ha

Major developments to achieve greenfield run-off rates wherever feasible and as a minimum 50% reduction in run off rates.

Comment: Not meeting policy requirement - proposing to limit to existing run-off rates. Applicant has not completed the SuDS Proforma or Microdrainage calculations.
Action for applicant: Submit required information as detailed on this page. SuDS are a requirement for all major planning applications, unless demonstrated to be inappropriate. The applicant should submit a revised Drainage Strategy, alongside the completed SuDS Proforma. The applicant should seek to achieve greenfield, or as a minimum 50% reduction in run-off rates. Microdrainage calculations should also be submitted. The applicant should also include drawings showing details of SuDS extent and position (including invert levels and site exceedance flows), as well as details on maintenance requirements and arrangements.

Developments to include SuDS unless inappropriate
Development should follow the drainage hierarchy in policy 5.13 of the London Plan

Comment: No reference to the SuDS hierarchy. Surface water drainage at the site will re-use existing drainage connections for rainwater pipes.
Action for applicant: To implement SuDS following the SuDS hierarchy, in line with local and national policy requirements, to achieve greenfield or minimum 50% reduction in run-off rates.

Developments in areas known to be at risk of surface water flooding are designed to cope with being flooded.

Comment: Development is in Flood Zone 1 therefore low risk of river flooding. The applicant's Drainage Strategy states that risk of groundwater flooding should be relatively low but that sustainable construction techniques for surfacing should minimise any potential groundwater risk. No evidence of historic sewer flooding on the site.

The SFRA maps indicate the site is at risk of surface water flooding (1/100 year event) with sites nearby at risk of flooding in the 1/30 year storm event. Therefore the development should seek to reduce surface water run off to greenfield or 50% existing to minimise risk on site and downstream.

Action for applicant: Seek to reduce surface water run-off to greenfield rate as per policy requirement, through the implementation of SuDS, following the SuDS hierarchy.

Appendix B

Rainwater Harvesting

Tanks Size Calculator

The tank size calculator service is provided by RainWater Harvesting so you can establish the size of tank you might decide to install. You will need to know the approximate dimensions of your house in metres. If in doubt, just pace out the house length and width.

Collectable Roof Area (m^2)

Main Building	Width:		Length:		Rain Collection Area:	0 m²
Extension one	Width:		Length:		Rain Collection Area:	0 m²
Extension Two	Width:		Length:		Rain Collection Area:	0 m²
Extension Three	Width:		Length:		Rain Collection Area:	0 m²
		Or the total roof area, if you already know it:		310	Total area of collectable roof space:	310 m²
Select Your Region		England SE & Central S			Average rainfall per year in your region:	64 L
Collectable rainwater per annum in litres - discounted by 20% to account for water loss						**158720 L**

Use of rainwater in the building

Number of people or bedrooms in the building -	*people:*	*bedrooms:* 39	
☑ Number of clothes washing cycles per day (*50 litres each*)	10.00 Cycles		500.00 L
☑ Number of toilet flushes per day (*4.42 flushes per person, average 5 litres each*)	176.80 Flushes		884.00 L
Outdoor use in litres, per person per day (*recommended 5 litres per person per day*)	0		0.00 L

Amount of water you require every day		1384	L
Amount of water you require every year	**DEMAND**	**505160**	**L**

Final Figures		
How many days drought protection do you need? Typically 21 (18 minimum)		
Capacity of water storage in litres required for drought protection	0.00	L
The lesser of YIELD (blue) or DEMAND (green) per annum	158720	L
Therefore, volume of rainwater storage required	**0**	**L**

Conclusion		
Is there sufficient roof water available:		NOT ENOUGH RAINWATER
Recommended tank size from our shallow dig range:	F-Line Range:	[F-Line Tank Range]
Select the carat range if you require a deep dig tank:	Carat Range:	[Carat Tank Range]

We can do the calculation for you if you supply the information requested below.

For us to do the calculation please give us a call on 01733 405111 and provide the following information :

1) Collectable Roof Area

2) Number of bedrooms in the property

3) Your location within the country

If you wish to work out the tank size yourself please click on the link below to download the Tank Size Calculator Spreadsheet.

Click Here

1. Insert your home's measurements, in metres, in the green boxes.
   Try to estimate the dimensions of that part of the house from which you will be collecting rain water.
2. Refer to the table on Tab "Rainfall" and find out the average annual rainfall in centimetres in your part of the country, then type it in the grey box; e.g. if you live in East Anglia, the driest part of the country, use 58.
3. Insert into the red box the number of people in the home,
4. Insert in the yellow box the number of days drought protection you would like from your rainwater harvesting system.
   You can change the number of weeks at will to see what impact it has on the tank size you need.
5. The results of the calculations are shown in section 12.

You're done! Congratulations.
To find the tanks suitable for your application, type the size of tank into the search box - say *2700* - and the search should bring up the tanks and systems of that tank size.

Further Advisory Notes - (Spreadsheet Version)

Many other companies, especially those publishing information on their websites, do us the honour of cribbing our tank size calculator. The only difference we can claim is that we keep ours up to date with the development of regulations, rainfall statistics, new tank products on the market and other aspects which might alter the calculations:

1. Lines 8 to 52 replicate the calculations of the UK Communities and Local Government paper "The Water Efficiency Calculator for new Dwellings" May 2009 available on the internet at http://www.planningportal.gov.uk/uploads/br/water_efficiency_calculator.pdf
   This is the official version of the same calculator required by the Code for Sustainable Homes as issued by BREEAM and by the Building Regulations Part G.
2. Our tank size calculator is simplified in only one respect, that is the amount of water used by typical toilets. The official calculator provides spaces for you to define single flush or dual flush toilets and their capacity or flow rate, whereas ours simplifies this to an average flush of 5 litres (at best, cistern of 6 litres and low flush of 2 litres, but often larger flush volumes). We retain the Code's 4.42 flushes per day ("Use Factor") times this.

   5 litres average volume per flush. If in doubt or if required by the authorities you should run the complete calculation which you can find at http://www.wrcplc.co.uk/PartGCalculator/Calculator.aspx Our washing machine usage is based on a wash for everyone in the home every 4 days.
3. The official calculator requires a minimum outdoor water of 5 litres per person per day. If you insert a larger figure in cell F42, as we suggest, and if the rainwater Yield of your roof is greater than the Demand, then the calculator will recommend a suitably larger tank. A small garden needs 200 litres a day and half an acre more like 400 litres a day (in spring and summer).
4. Paragraph 12 provides you the volume of rainwater storage required according to the "Code" calculation as referred to in 1 and 2 above. Our tank size recommendations are based on this.
5. We add in the light green box at the bottom the recommendations of the British Standard BS 8515-2009. This will typically give a smaller tank size because the drought protection is about 18 days not 21 days. Use it as a check, or select this volume, as you choose. Our calculator uses the BS 8515 "intermediate approach".
6. Paragraph 8 uses a roof and filter coefficient of 80% (cell F35) which is 10% loss of water off the roof (mostly evaporation) and 10% filter loss (water going to drain with debris and leaves). Roof loss is much greater if you have a sedum or other organic roof.

Appendix C

SuDS 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	No. 1 FERDINAND PLACE, LONDON, NW1 8EE
Address & post code or LPA reference	"
Grid reference	528506, 184341
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?	NO.
Total Site Area served by drainage system (excluding open space) (Ha)*	0.0615 Ha.

* 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)	0.0615	0.0615	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	—	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	✓		INCLUDED IN 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		✓		e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse		✓		e.g. Is there a watercourse nearby?
To surface water sewer	✓		COMBINED SEWER.	Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above		✓		e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.
Has the drainage proposal had regard to the SuDS hierarchy?	✓		CONSIDERED BUT NOT VIABLE DUE TO NATURE	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.	✓		OF DEVELOPMENT, REFER TO DRAINAGE REPORT.	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	7.57	7.57	0	0	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	15.31	15.31	0	0	
1in 100			0	0	
1 in 100 plus climate change	~~N/A~~ 21.19	21.19	0	0	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					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					
1in 100 6 hour					
1 in 100 6 hour plus climate change					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)		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)		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)		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,		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	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	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	UNKNOWN.	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?	DESK	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 ATTENUATION DUE TO SPATIAL CONSTRAINTS.	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.	FREE DISCHARGE DUE TO SPATIAL CONSTRAINTS	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 TO REDUCE OVERALL FLOW/VELOCITY	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	FREE DISCHARGE	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.	FREE DISCHARGE	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.	N/A.	**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)?	N/A.	**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)	NOT RESTRICTED. AS EXISTING.	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.	PRIVATE MANAGEMENT COMPANY UNDER SITE OWNER'S RESPONSIBILITY.	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?		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		
Section 3	REFER TO TSP DRAINAGE STRATEGY REPORT.	
Section 4		
Section 5		
Section 6		
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..... ANDY JOHNSON .....
Qualification of person responsible for signing off this pro-forma ..... MENG .....

Company..... STILLWELL LIMITED .....
On behalf of (Client's details) ..... LEVERTON & SONS .....
Date:..... 15/08/16 .....

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