Design and Access Statement

6 Streatley Place, Hampstead, London NW3 1HP

Appendix 7 -
Flood Risk Assessment

Surface Water Run-Off and Flood Risk Assessment report

For the proposed development at

6 Streatley Place, Hampstead, Camden. NW3 1HP

Prepared by

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Innervision Design Ltd

For the client, Mark Robinson

October 2014

INNERVISION DESIGN

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Disclaimer

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1 Executive Summary

A. The proposed development meets the mandatory SUR 1 requirements by default, the credits for water quality are not pursued.

B. The developed area of the proposed site lies in Flood Zone 1 therefore having extremely low possibility of flooding from sea and rivers. Two SUR 2 credits are recommended.

2 Introduction

2.1 Site location

The site is at 6 Streatley Place, Hampstead, Camden, NW3 1HP, Figures 1 & 2.

Figure 1: Site location, highlighted in red, as provided by architect.

2.2 Proposed development description

The proposed development consists of the construction of three storey building. Externally, the landscaping is proposed to be a mix of garden planting, lawns, and block paving for parking in the front.

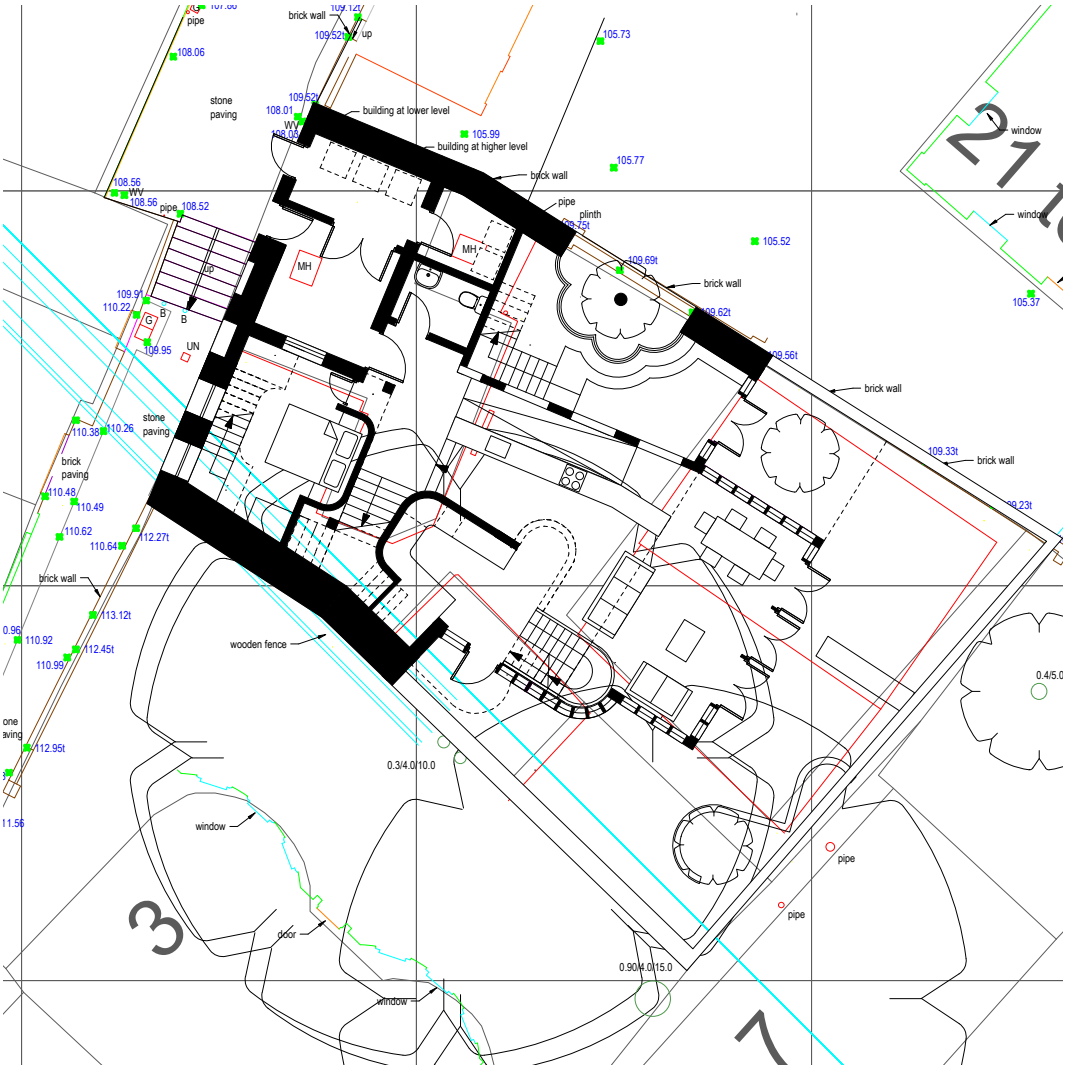

Figure 2: Site plan, as provided by architect.

3 Code for Sustainable Homes

3.1 Surface Water Run-off (SUR 1)

Management of Surface Water Run-off from Developments (SUR 1)[2] is a mandatory requirement for new developments to achieve any level of the Code rating.

SUR 1 aims to:

> "To design surface water drainage for housing developments which avoid, reduce and delay the discharge of rainfall run-off to watercourses and public sewers using SuDS techniques. This will protect receiving waters from pollution and minimise the risk of flooding and other environmental damage in watercourses."

SUR 1 requires new developments to meet three mandatory Hydraulic Control Criteria (no credits awarded):

1. Peak Rate of Run-off. "If there is no increase in the man-made impermeable area as a result of the new development, then the peak rate of run-off criterion does not apply. Where there is an increase in impermeable area, ensure that the peak rate of run-off over the development lifetime, allowing for climate change, will be no greater for the developed site than it was for the pre development site. This should comply at the 1 year and 100 year return period events. Where the pre development peak rate of run-off for the site would result in a requirement for the post-development flow rate (referred to as the limiting discharge) to be less than 5 l/s at a discharge point, a flow rate of up to 5 l/s may be used where required to reduce the risk of blockage."

2. Volume of Run-off. "If there is no increase in the man-made impermeable area as a result of the new development, then the volume of run-off criteria does not apply. If the developed site would otherwise discharge, over the development lifetime allowing for climate change, a greater volume of rainwater run-off than the pre development site for the 100 year 6 hour event, then criterion A applies. If A cannot be satisfied then B applies.

   2A: Ensure that the post development volume of run-off, allowing for climate change over the development lifetime, is no greater than it would have been before the development. The additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SuDS techniques.

2B: If A cannot be satisfied then reduce the post development peak rate of run-off to the limiting discharge. The limiting discharge is the pre development flow rate equivalent to the 1-year peak flow rate, mean annual flood flow rate (Qbar) or 2 l/s/ha, whichever is the highest flow rate."

3. Designing for local drainage system failure. "Demonstrate that the flooding of property would not occur in the event of local drainage system failure (caused either by extreme rainfall or a lack of maintenance).

Water Quality Criteria (additional credits)

1. One credit can be awarded by ensuring there is no discharge from the developed site for rainfall depths up to 5 mm.

2. One credit can be awarded by ensuring that the run-off from all hard surfaces shall receive an appropriate level of treatment in accordance with The SuDS Manual to minimise the risk of pollution.

Default Cases

1. The mandatory criteria can be deemed to be met by default if the site discharges rainwater directly to a tidal estuary or the sea. Credits cannot be awarded unless the relevant water quality criteria are met.

Special Cases for sites with existing infrastructure and planning approval

1. For sites where planning approval (covering the detailed drainage strategy for the site) has been granted prior to the Code requirements being set for the development, the mandatory element of Sur 1 can be met by default. No credits for water quality can be awarded if the mandatory element is met using this method.

2. For sites where the assessed dwellings are directly connected to existing infrastructure which pre-dates the Code requirements for the site, the mandatory element of Sur 1 can be met by default. No credits for water quality can be awarded if the mandatory element is met using this method.

3. Note: The phrase "directly connected to existing infrastructure" should be interpreted as individual dwellings being directly connected to the existing sewer without any significant shared installation (this Special Case is predominantly only relevant for single dwellings). It does not cover instances where an entire site or new shared system is being connected into the existing main sewer. It should be a simple connection from a dwelling into an existing manhole/sewer rather than a new network being created.

3.2 Flood Risk Assessment (SUR 1)

Flood Risk Assessment is required to satisfy the CSH mandatory issue Management of Surface Water Run-off from Developments (SUR 1).

With reference to the "Code for Sustainable Homes: Technical Guide November 2012"[2]:

- The definition of Flood Risk Assessment (FRA).

  "A study to assess the risk of a site flooding and the impact that any changes or development on the site will have on flood risk on the site and elsewhere. A flood risk assessment must be prepared according to good practice guidance as outlined in PPS25 Development and Flood Risk: Practice Guide (available from www.communities.gov.uk). For developments of less than 1 ha (10,000 m²), the level of detail required in an acceptable FRA (for Sur 1) will depend on the size and density of build. This will range from a brief report for small, low-density developments, to a more detailed assessment for a high-density development of 2000–10,000 m². For example, for very small developments (2000 m² and less), an acceptable FRA could be a brief report carried out by the contractor's engineer confirming the risk of flooding from all sources of flooding, including information obtained from the Environment Agency, water company/sewerage undertaker, other relevant statutory authorities, site investigation and local knowledge."

- Sources of flooding and flood risk which need to be assessed.

  "**Streams and Rivers**: Flooding that can take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.

  Coastal or Estuarine: Flooding that can occur from the sea due to a particularly high tide or surge, or combination of both.

  Groundwater: Where the water table rises to such a height where flooding occurs. Most common in low-lying areas underlain by permeable ground (aquifers), usually due to extended periods of wet weather.

  Sewers and highway drains: Combined, foul or surface water sewers and highway drains that are temporarily over-loaded due to excessive rainfall or due to blockage.

  Surface water: The net rainfall falling on a surface (on or off the site) which acts as runoff which has not infiltrated into the ground or entered into a drainage system.

  Infrastructure failure: canals, reservoirs, industrial processes, burst water mains, blocked sewers or failed pumping stations.

3.3 Flood Risk Assessment (SUR 2)

Flood Risk Assessment is required in order to gain credits on the CSH trade-able issue Flood Risk (SUR 2).

With reference to the "Code for Sustainable Homes: Technical Guide November 2012"[2]:

- Aim. "To promote housing development in low flood risk areas, or to take measures to reduce the impact of flooding on houses built in areas with a medium or high risk of flooding."
- "Two credits are available for developments situated in Zone 1 – low annual probability of flooding (as defined in PPS25 Development and Flood Risk) and where the site-specific Flood Risk Assessment (FRA) indicates that there is low risk of flooding from all sources."
- "One credit is available for developments situated in Zones 2 and 3a – medium and high annual probability of flooding where the finished ground floor level of all habitable parts of dwellings and access routes to the ground level and the site, are placed at least 600 mm above the design flood level of the flood zone. The Flood Risk Assessment accompanying the planning application must demonstrate to the satisfaction of the local planning authority and statutory body that the development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed."

4 SUR1 Hydraulic Control Criteria (mandatory requirements)

4.1 Proposed site drainage

It is understood from the architect that an existing combined foul/surface water drainage infrastructure is being used, see Figure 3. This existing infrastructure pre-dates the requirements of the Code.

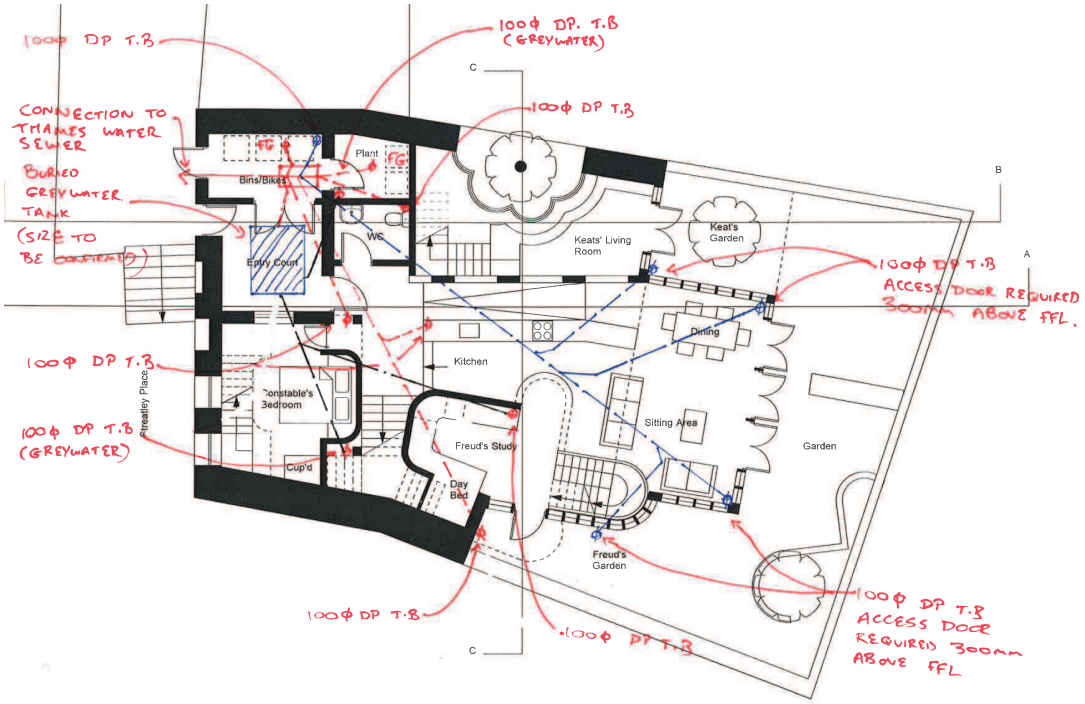

Figure 3: Drainage strategy, as provided by architect.

4.2 Summary

The Code for Sustainable Homes Technical Guide stipulates that "For sites where the assessed dwellings are directly connected to existing infrastructure which pre-dates the Code requirements for the site, the mandatory element of Sur 1 can be met by default. No credits for water quality can be awarded if the mandatory element is met using this method".

The proposed development meets the mandatory SUR 1 requirements by default, the credits for water quality are not pursued.

5 SUR 1 and SUR 2 Flood Risk Analysis

5.1 Flood risk from sea and rivers

Flooding can occur from the sea due to a particularly high tide or surge, or combination of both. Flooding can also take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.

With reference to the Environment Agency Flood Map, the developed area of the proposed site lies in Flood Zone 1. This means that the developed area of the proposed site has extremely low vulnerability from river and sea flooding (less than 1 in 1000 annual probability of river or sea flooding in any year).

5.2 Flood risk from the public sewerage and highway drains

Flooding can occur when combined, foul or surface water sewers and highway drains are temporarily over-loaded due to excessive rainfall or due to blockage.

The Council's Flood Risk Management Strategy (FRMS)[1] shows no record of flooding from the public sewerage and highway drains in the vicinity of the site.

5.3 Flood risk from infrastructure failure

Flooding can occur due to canals, reservoirs, industrial processes, burst water mains, blocked sewers or failed pumping stations.

The EA and the Council show no record of flooding from other sources, such as canals, reservoirs, in the vicinity of the proposed site.

5.4 Flood risk from surface water and groundwater

Flooding can occur when the net rainfall falling on a surface (on or off the site) which acts as runoff which has not infiltrated into the ground or entered into a drainage system. Flooding can also occur where the water table rises to such a height where flooding occurs. Most common in low-lying areas underlain by permeable ground (aquifers), usually due to extended periods of wet weather.

No documented evidence has been found of Surface water flooding to site location. Furthermore, the mapping data provided within Camden's FRMS does not indicate a risk of surface water flooding to the area of and around the site. Camden's FRMS indicates an uncertain risk from groundwater flooding within the entire borough, however

the site does not lie in area with a groundwater flood risk potential hence, the risk from both ground and surface water flooding is considered to be Low.

5.5 Summary

Flood risk from various sources at the site has been analysed in this section.

It is concluded that the risk of flooding from all sources is considered low.

It is recommended that two SUR 2 credits are awarded.

6 CSH declaration

I hold a Doctorate and a First class BEng with Honours degree in Civil Engineering from the University of Southampton. I am currently a member of the British Hydrological Society and a Chartered Building Engineer. I developed Flood Risk Probability software for use within the industry and academia. I have experiences of undertaking Flood Risk Assessment and SuDS design for many projects. I hereby declare that I am an appropriately qualified professional in line with the CSH definition.

Dr R D Saunders C. Build E, MCABE, BEng(Hons), PhD

Signed: 

Date: 6th October, 2014

References

[1] London Borough of Camden. The London Borough of Camden flood risk management strategy. Technical report, 2013.

[2] Department for Communities and Local Government. Code for sustainable homes - technical guide. Nov 2010.

A SUR 1 Template

SUR 1 - Summary Report Template
Introduction:
This template can be used to demonstrate compliance with the criteria specified in Sur 1 in the Code for Sustainable Homes. The form can be used by the Code Assessor to aid in assessing the Sur 1 issue and can be provided as supporting evidence in addition to the items listed in the schedule of evidence for Sur 1. Completing this template is optional (where this template is not used, a summary in the format of this template must be provided). National policy documents have been used to set the standards for the mandatory element of Sur 1. PPS25 Development and Flood Risk (ODPM, 2006) and the SuDS manual are two of the key documents used. Further reading is listed in the References section of the Technical Guide.
Instructions:
Where submitting this template as supporting evidence for a Code assessment please ensure that the assessor completes the contact details (Section A) and the appropriately qualified professional completes the rest of the template, ensuring that it is signed and dated. If the form is incomplete and / or unsigned it will not be accepted as evidence supporting a Code assessment. The Technical Guide states the calculation methodologies to be used to demonstrate compliance with some aspects of the criteria, for example the greenfield runoff rates. Although flexibility in choice of methodology is available for some of the criteria, best practice methodologies should always be used. If required, information regarding applicable calculation methodologies can be found in the SUDS Manual (CIRIA, 2007). Reputable software, such as Microdrainage, can be used for calculation purposes.

Code for Sustainable Homes - Technical Guidance Issue
This template is for use with the following technical guidance issue(s): • November 2010

Section A - To be completed by the Code assessor	
Contact Details:	
Consultant / Engineer details	
Company Name:	Innervision Design Ltd
Company Address:	26 The Barons, Bishops Stortford, Herts. CM23 4HR
Contact Name:	Dr R Saunders C. Build E, MCABE, BEng(Hons), PhD
Contact Telephone Number:	07766 541458
Developer / Client details	
Company Name:	
Company Address:	
Contact Name:	
Contact Telephone Number:	
Developer details	
Company Name:	
Company Address:	
Contact Name:	
Contact Telephone Number:	

Section B - To be completed by the Appropriately Qualified Professional		
Mandatory Requirements		
Part 1: Appropriately Qualified Professional		
1.	Please tick one of the appropriate boxes to confirm where details have been provided to corroborate your suitability to undertake the calculations and design criteria for the SUR 1 assessment.[1]	
	A. Details have been provided within the SUR 1 report and issued to the Code assessor.	☐
	Or:	
	B. Details have been provided within a CV and issued to the Code assessor.	☐
	Or:	
	C. Details have been provided within a letter/email and issued to the Code assessor.	☐
	Or:	
	D. Details are provided below.	
	Please state your experience / qualifications to undertake the calculations and design criteria: I hold a Doctorate and a First class BEng with Honours degree in Civil Engineering from the University of Southampton. I am currently a member of the British Hydrological Society. I developed Flood Risk Probability software for use within the industry and academia. I have experiences of undertaking Flood Risk Assessment and SuDS design for many projects. I hereby declare that I am an appropriately qualified professional in line with the CSH definition.	☒

Part 2: Assessment Information		
2.	For sites containing a mixture of non-Code and Code assessed dwellings there are several assessment options for Sur 1. The first would be to assess the whole site (including the non-Code dwellings) under the Code criteria. The second would be to demonstrate with several separate reports that each group of Code dwellings (and the associated sub catchments serving those dwellings) on the site have met the criteria individually. Please tick one of the following boxes;	
	A. The site contains a mixture of Code and non-Code dwellings and the whole site has been assessed under the Sur 1 criteria including any associated sub catchments serving these dwellings.	☐
	Or:	
	B. The site contains a mixture of Code and non-Code dwellings and there is more than one assessed area for Sur 1 within the site boundary. Please write the number of assessed areas within the site in the space provided below (you will need to complete this template for each assessed area)[2].	☐
	Number of assessed areas:	
	Or:	
	C. The site only contains Code assessed dwellings and the associated sub catchment serving those dwellings.	☒

Part 3: Site Information (N/A - Special case applies)			
3.	A. Please provide the site area[3] (delete units of measurement as applicable)		m^2

[1] Refer to the technical guide for details on the definition of an appropriately qualified professional.

[2] It would aid the QA process to provide a site plan highlighting each assessment area and highlighting which area is being assessed in this report.

[3] The site area will include all areas within the boundaries of the site, including both permeable and impermeable areas. If box B, Part 2 has been ticked, the 'site area' will be only that for which this template demonstrates compliance.

	B. Please provide the impermeable area of the site pre-development (delete units of measurement as applicable)		m^2
	C. Please provide the impermeable area of the site post development (delete units of measurement as applicable)		m^2

Part 4: Special Cases[4]		
4.	Please tick the relevant box below to identify where a special case applies for the site:	
	A. The impermeable area has decreased as a result of the development, and the mandatory element of this issue has been met by default.	☐
	B. A minimum flow rate or maximum storage requirement has been set by the sewerage undertaker (or other statutory body).	☐
	C. Planning approval has been granted for the detailed drainage strategy prior to the Code requirement being set for the development	☐
	D. The assessed dwelling is directly connected to existing infra-structure which pre-dates the Code requirement.	☒
	E. Not applicable.	☐
5.	Tick one or both of the following to confirm if some or all of the highways will be omitted from the impermeable areas in the calculations for one of the following reasons[5]:	
	A. The highways are being adopted	☐
	B. The Code dwellings are being built beside existing highways.	☐
	C. Not applicable.	☐

Part 5: Peak Rate of Runoff (N/A - Special case applies)			
6.	A. Pre-development peak rate of runoff for the **1 year return period event** [6]		l/s
	B. Post-development peak rate of runoff for the **1 year return period event** [6] (this figure must be less than or equal to A, except where the 5l/s rule has been used)		l/s
	C. Pre-development peak rate of runoff for the **100 year return period event** [6]		l/s
	D. Post-development peak rate of runoff for the **100 year return period event** [6] (this figure must be less than or equal to C, except where the 5l/s rule has been used)		l/s
7.	Please tick this box to confirm that the 5l/s rule has been applied where the peak rates of runoff have increased post development, but are still equal to or less than 5l/s.		☐
8.	If, post-development, it was necessary to reduce the peak rate of runoff to meet the Code criteria, please provide a brief explanation below describing how the peak rate was reduced. For example, 'soakaways reduce the peak rate of runoff to pre-development levels'.[7]		N/A ☐
9.	Please tick this box to confirm that the post development peak rate of runoff calculations include an allowance for		☐

[4] Refer to the Technical Guide for details on the supporting evidence required to demonstrate compliance with these special cases. This evidence must be provided to demonstrate how the special case is being met.

[5] Refer to the technical guide for details on when an adoptable road can be omitted from the assessment.

[6] Peak rate of runoff calculations should be carried out for the range of storm durations up to and including the 6 hour storm. The peak rate of runoff for the storm event will then be the 'worst case' runoff rate for the range of storm durations. The climate change allowance should be added only to the post development calculations.

[7] Note that detailed documentary evidence (as per the schedule of evidence table in the Technical guide) is required to demonstrate how the peak rate of runoff has been reduced.

	climate change in accordance with current best practice (PPS25, 2006).	
10.	Please tick one of the following boxes as applicable to this site:	
	A. This is a greenfield site and is less than 50 ha therefore runoff rate calculations have been carried out in accordance with the IH Report 124 'Flood estimation for small catchments' (Marshall and Bayliss, 1994). The pro rata method on the size of catchment detailed in table 4.2 of the SuDS manual has been used.	☐
	B. This is a greenfield site of 50 to 200 ha therefore runoff rate calculations have been carried out in accordance with the IH Report 124 'Flood estimation for small catchments' (Marshall and Bayliss, 1994).	☐
	C. This is a greenfield site of more than 200 ha (or where there is a preference to do so and the catchment is considered suitable for its application) therefore runoff rate calculations have been carried out in accordance with the 'Flood estimation handbook' (Centre for Ecology and Hydrology, 1999).	☐
	D. This is a greenfield site of more than 200ha where the Flood Estimation handbook is considered inappropriate for the development therefore the IH Report 124 has been used.	☐
	E. This is a brownfield site and runoff rates have been calculated in accordance with current best practice simulation modelling.	☐
	F. This is a Brownfield site where the pre development surface water drainage system is not known therefore the runoff rates have been calculated using the Greenfield run-off model ticked above (please tick the relevant methodology), but using soil type 5.	☐

Part 6A: Volume of Runoff (N/A - Special case applies)			
11.	Please tick this box to confirm that the following post development volume of runoff calculations include an allowance for climate change in accordance with current best practice (PPS25, 2006).		☐
	Please tick this box to confirm that the following volume of runoff calculations are for the 100 year event of 6 hour duration.		☐
12.	A. Pre-development volume of runoff	0	m^3
	B. Volume of runoff caused by the new development **prior to mitigation**	0	m^3
	C. **Additional** predicted volume of rainwater caused by the new development prior to mitigation (= 12B - 12A)	0	m^3
	D. If the answer to 12C is greater than zero, please provide a brief explanation below describing how you have reduced the additional volume discharged from the developed site, for example, 'soakaways will infiltrate all of the additional volume': (criterion Part 6A cannot be satisfied, see section 13)		N/A ☐
	Please provide the additional volume of runoff discharged from the site when all (if any) mitigation measures described in 12D are in place.	0	m^3
13.	A. Where there is an increase in the volume of runoff as a result of the development and criteria "Part 6A" cannot be satisfied via infiltration or other SuDS techniques (as listed below), please provide an explanation below (evidence to support the reasoning should be provided in the hydrological report):		
	Soakaways:		
	Porous/Pervious paving:		

	Rainwater re-use harvesting:
	Green Roof:
	Other surface infiltration techniques:

Part 6B: Volume of Runoff (N/A - Special case applies)			
14.	Where it has not been possible to reduce all of the additional volume by infiltration or other SuDS techniques, the volume of runoff should be discharged in accordance with one of the following rates of runoff, whichever is the higher. Please tick one of the boxes below to confirm the level of flow control that has been achieved:		
	A. The peak discharge rate has been reduced to pre development 1 year peak flow rate		☐
	Please state the pre development 1-year peak flow rate:		l/s
	Or:		
	B. The peak discharge rate has been reduced to the site's estimated mean annual flood flow rate (Qbar).		☐
	Please state Qbar:		l/s
	Or:		
	C. The peak discharge rate has been reduced to 2l/s/ha.		☐
	Please state the peak discharge rate at 2l/s/ha:		
	Or:		
	D. The limiting discharge rate requires a flow rate of less than 5l/s at a discharge point, therefore a flow rate of up to 5l/s has been used		☐

Part 7: Designing for Local Drainage System failure (N/A - Special case applies)		
15.	Tick here to confirm that the consequences of system failure caused by extreme rainfall, lack of maintenance, blockage or other causes, have been considered and evaluated fully and there will be no increased risk to dwellings either on or off site.[8]	☐

Section C - To be completed by the Appropriately Qualified Professional		
Awarding of Credits		
Part 8: Water Quality Criteria (Not available)		
16.	A. Tick here to confirm that there will be no discharge from the developed site for rainfall depths up to 5 mm. Please provide a brief explanation below describing how the runoff from rainfall depths up to 5 mm will be prevented from leaving the site:	☐

[8] Refer to the technical guide for details on the evidence that would be required to demonstrate that this has been considered fully.

	B. Tick here to confirm that the runoff from all hard surfaces shall receive an appropriate level of treatment in accordance with the SuDS Manual to minimise the risk of pollution to the receiving watercourse. Please provide a brief explanation below describing how the hard surfaces will receive an appropriate level of treatment:	☐

Section D - To be completed by the Appropriately Qualified Professional		
Part 9: Confirmation		
17.	The following declaration should be signed by the appropriately qualified professional responsible for ensuring that the development meets the SUR 1 mandatory criteria and the necessary criteria to allow the awarding of credits, where applicable.	
	I confirm that the information provided in this document is truthful and accurate at the time of completion.	
	Name of Appropriately Qualified Professional:	Dr R D Saunders
	Signature of Appropriately Qualified Professional:	
	Date:	06.10.14