

# Surface Water Drainage Guidance for Developers



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# 1 Document Purpose

## 1.1 Introduction

- 1.1.1 A significant amount of new development will occur in Cambridgeshire over the next 20 years and beyond. In order to reduce the impact upon the water environment, development must be appropriately located, well designed, managed and take account of the impacts of climate change.
- 1.1.2 This guidance has been prepared to support developers and their consultants in the preparation of surface water documents to support planning applications. It has been prepared with input from an advice group made up of the Lead Local Flood Authority (LLFA), house builders and consultants/engineers to ensure it is as relevant and up-to-date as possible.
- 1.1.3 This document is 'live' and will therefore be reviewed annually and updated should new guidance or legislation be introduced.



*Photo 1: Attenuation basin at Loves Farm, St Neots*

## 2 Policy Background and LLFA role

### 2.1 Statutory Consultee

2.1.1 The LLFA is a statutory consultee to the planning process for all Major developments. Major development is defined<sup>1</sup> as development involving any one or more of the following:

- (a) the winning and working of minerals or the use of land for mineral-working deposits;
- (b) waste development;
- (c) the provision of dwelling-houses where—
  - a. the number of dwelling-houses to be provided is 10 or more; or
  - b. the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i);
- (d) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
- (e) development carried out on a site having an area of 1 hectare or more.

2.1.2 As a statutory consultee we are required to provide a substantive response to any consultations we receive. A substantive response is one which: –

- (a) states that the consultee has no comment to make;
- (b) states that, on the basis of the information available, the consultee is content with the development proposed;
- (c) refers the consultor to current standing advice by the consultee on the subject of the consultation; or
- (d) provides advice to the consultor.

2.1.3 The LLFA will endeavour to reply to statutory consultations within 21 days of being consulted.

### 2.2 National Planning Policy Framework

2.2.1 In March 2012 Government published the [National Planning Policy Framework \(NPPF\)](#). The framework acts as guidance for LPAs and decision-takers in making decisions about planning applications. Section 14 of this document contains key information on how flood risk and sustainable drainage systems (SuDS) should be considered as part of new development.

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<sup>1</sup> by Article 2(1) in Part 1 (Preliminary) of the Town and Country Planning (Development Management Procedure) (England) Order 2015

## 2.3 Planning Practice Guidance

- 2.3.1 The [Planning Practice Guidance \(PPG\)](#) has been produced to support the NPPF. Paragraph 079 of the Planning Practice Guidance (PPG) states, *'New development should only be considered appropriate in areas at risk of flooding if priority has been given to the use of sustainable drainage systems. Additionally, and more widely, when considering major development... sustainable drainage systems should be provided unless demonstrated to be inappropriate'*.
- 2.3.2 Paragraph 081 of the PPG states, *'In considering a development that includes a sustainable drainage system the local planning authority will want to be satisfied that the proposed minimum standards of operation are appropriate and that there are clear arrangements in place for ongoing maintenance'*.

## 2.4 Cambridgeshire Flood & Water Supplementary Planning Document

- 2.4.1 The [Cambridgeshire Flood & Water Supplementary Planning Document \(SPD\)](#) has been prepared by Cambridgeshire County Council (as the LLFA) in conjunction with the other Cambridgeshire Local Planning Authorities (LPAs) to provide guidance on the approach that should be taken to design new developments to manage and mitigate flood risk and include sustainable drainage systems (SuDS).
- 2.4.2 The SPD has been adopted by all Council's within Cambridgeshire. For the avoidance of doubt these are:

1. **South Cambridgeshire District Council**
2. **Fenland District Council**
3. **East Cambridgeshire District Council**
4. **Huntingdonshire District Council**
5. **Cambridge City Council**

# 3 Pre-application discussions

## 2.5 Introduction

2.5.1 As LLFA we offer a pre-application service for all scales of development. The aim of pre-application discussions is to guide developers through the planning process to ensure high quality developments can be delivered across Cambridgeshire. The service is structured to provide 'in principle' feedback on your proposals as well as more detailed discussions and negotiations on a scheme prior to formal submission as a planning application.

2.5.2 As part of the pre-application service we can offer advice on the following:

<ul style="list-style-type: none"><li>• Topography &amp; drainage patterns</li></ul>	<ul style="list-style-type: none"><li>• Proposed surface water destination</li></ul>	<ul style="list-style-type: none"><li>• Permitted discharge rates/volumes</li></ul>
<ul style="list-style-type: none"><li>• Attenuation volumes and locations</li></ul>	<ul style="list-style-type: none"><li>• Flood risk to and from the site</li></ul>	<ul style="list-style-type: none"><li>• Third party consents</li></ul>
<ul style="list-style-type: none"><li>• Any required off-site works</li></ul>	<ul style="list-style-type: none"><li>• Temporary drainage during construction</li></ul>	<ul style="list-style-type: none"><li>• Presence of sensitive receptors</li></ul>
	<ul style="list-style-type: none"><li>• Future maintenance and adoption of SuDS</li></ul>	

## 2.6 Types of Pre-application Discussions

2.6.1 We understand that the type of advice required for each development may differ; therefore we offer two options:

### Written advice only

This is most suitable for those developers who have already advanced quite far with their drainage strategies and are looking for a review of their proposals. We will undertake a full review of any submitted documents and provide detailed comments within 14 days of instruction.

### Meeting with LLFA Officer with follow up written advice

This is most suitable for those developers who have ideas about how to approach their drainage strategy but who would like to discuss the detail with an LLFA officer. The benefit of this service is that discussions can take place 'there and then' and agreements in principle can be reached following detailed discussions of proposals.

## 2.7 Cost

2.7.1 Table 1 outlines the cost of our pre-application service. Payment via cheque or upon receipt of an invoice is accepted.

		Written advice only		Single meeting with one drainage planning officer with follow up written advice		Additional work	
Residential		Excl VAT	Incl VAT	Excl VAT	Incl VAT	Excl VAT	Incl VAT
Number of dwellings	1-9 (minor)	£105	<b>£126</b>	£210	<b>£252</b>	£50 / hour	<b>£60 / hour</b>
	10-50	£160	<b>£192</b>	£290	<b>£348</b>		
	51-200	£265	<b>£318</b>	£475	<b>£570</b>		
	201+	£370	<b>£444</b>	£580	<b>£696</b>		
Non-residential							
Floor Space (m <sup>2</sup> )	0-1,000 (minor)	£105	<b>£126</b>	£210	<b>£252</b>	£50 / hour	<b>£60 / hour</b>
	1,001 – 10,001	£160	<b>£192</b>	£290	<b>£348</b>		
	10,001 – 25,000	£265	<b>£318</b>	£475	<b>£570</b>		
	> 25,000	£370	<b>£444</b>	£580	<b>£696</b>		
Advice on discharging surface water conditions							
All		£204	<b>£252</b>	£408	<b>£504</b>	£50 / hour	<b>£60 / hour</b>

Table 1: LLFA Pre-app charging schedule

## 2.8 Using the pre-application service

2.8.1 If you wish to take up our pre-application service please use our [online application form](#) where you will be required to outline the following details:

- a. Type of pre-application service required
- b. Type, scale and location of development
- c. Contact details

2.8.2 An Officer from the LLFA will respond to your enquiry and make appropriate arrangements.

## 4 Formal Submission Requirements

### 3.1 Introduction

- 3.1.1 To enable the LLFA to provide its response as a statutory consultee the developer should produce a surface water drainage strategy for the proposed development that includes the level of information corresponding to the type of application submitted.
- 3.1.2 We have produced a series of checklists in the following sections which provide a summary of the expected level of information. Further information may be requested to support the application where there are complex local issues. This information will draw on other information contained within the planning application but is required by the LLFA to ensure the standard of surface water management is appropriate.
- 3.1.3 Working from these checklists will help developers to ensure the LLFA does not object to the application on the grounds of lack of information. If, during the preparation of a surface water drainage strategy you have any questions about the required information then please don't hesitate to contact us at [fr.planning@cambridgeshire.gov.uk](mailto:fr.planning@cambridgeshire.gov.uk). Contacting the LLFA during the early stages to clarify any issues will also help reduce the likelihood of an objection.

## 3.2 Outline Applications

3.2.1 Further detail has been provide on some items within this table. They are provided later in the document or can be accessed by clicking on the hyperlinks.

	Outline	(✓)
1	Type of development (e.g. new development, extension to existing development, change of use)	
2	Status of site (i.e. greenfield or previously developed)	
3	Total site area (ha)	
4	Existing impermeable area (ha)	
5	Proposed impermeable area / developable area (ha) (including an <a href="#">allowance for urban creep</a> )	
6	Description of site topography	
7	Identification of watercourses within vicinity of site and their outfalls and associated flood risk	
8	Description of ground conditions (using site investigation reports where available) including information regarding geology and groundwater depth	
9	Identification of any surface water flood risk	
10	<a href="#">Existing site drainage arrangements</a>	
11	Proposed method of surface water disposal (using drainage hierarchy) & supporting evidence	
12	<a href="#">Existing runoff rates (l/s/ha)</a>	
13	<a href="#">Proposed runoff rates (l/s/ha)</a>	
14	<a href="#">Existing runoff volumes (m<sup>3</sup>/ha)</a>	
15	<a href="#">Proposed runoff volumes (m<sup>3</sup>/ha)</a>	
16	<a href="#">Required volume of attenuation (m<sup>3</sup> per m<sup>2</sup> of impermeable area)</a>	
17	<a href="#">Appropriate consideration of climate change</a>	
18	<a href="#">Preliminary SuDS proposals (type, location, size)</a>	
19	<a href="#">Infiltration test results in accordance with BRE365 (if proposing infiltration) or second viable option for surface water disposal if testing has not been undertaken</a>	
20	Evidence of in principle agreement from third party if discharging into their system	
21	Preliminary site layout plans (including SuDS features)	
22	Details of proposed phasing (if applicable) and how each phase will be delivered in relation to the strategic surface water drainage strategy	

### 3.3 Full Applications

3.3.1 Further detail has been provide on some items within this table. They are provided later in the document or can be accessed by clicking on the hyperlinks.

	Full	(✓)
1	Type of development (e.g. new development, extension to existing development, change of use etc.)	
2	Status of site (i.e. greenfield or previously developed)	
3	Total site area (ha)	
4	Existing impermeable area (ha)	
5	Proposed impermeable area / developable area (ha) (including an <a href="#">allowance for urban creep</a> )	
6	Description of site topography	
7	Identification of watercourses within vicinity of site and their outfalls and associated flood risk	
8	Description of ground conditions (using site investigation reports where available) including information regarding geology and groundwater depth	
9	Identification of any surface water flood risk & proposed mitigation	
10	<a href="#">Existing site drainage arrangements</a>	
11	<a href="#">Proposed method of surface water disposal (using drainage hierarchy) &amp; supporting evidence</a>	
12	<a href="#">Existing runoff rates (l/s/ha)</a>	
13	<a href="#">Proposed runoff rates (l/s/ha)</a>	
14	<a href="#">Existing runoff volumes (m<sup>3</sup>/ha)</a>	
15	<a href="#">Proposed runoff volumes (m<sup>3</sup>/ha)</a>	
16	<a href="#">Total required volume of attenuation (m<sup>3</sup>)</a>	
17	<a href="#">Appropriate consideration of climate change</a>	
18	<a href="#">SuDS proposals (type, location, size)</a>	
19	<a href="#">Infiltration test results in accordance with BRE365 (if proposing infiltration) or second viable option for surface water disposal if testing has not been undertaken</a>	
20	Evidence of in principle agreement from third party if discharging into their system	
21	<a href="#">Drainage layout drawing &amp; supporting hydraulic calculations</a>	
22	<a href="#">Management/maintenance plan and on-going maintenance responsibilities</a>	
23	Site layout plans	

### 3.4 Discharge of Condition

3.4.1 The wording of surface water conditions may vary between Local Planning Authorities as they are not obliged to use the wording we suggest within our consultation responses. However the checklist below should provide the majority of what we would require to discharge most surface water conditions:

3.4.2 Further detail has been provide on some items within this table. They are provided later in the document or can be accessed by clicking on the hyperlinks.

	<b>Discharge of Condition</b>	(✓)
1	<a href="#">Detailed drainage layout</a>	
2	Proposed impermeable area (ha)	
3	<a href="#">Proposed method of surface water disposal (using drainage hierarchy) &amp; evidence to support this</a>	
4	<a href="#">Proposed runoff rates (l/s/ha)</a>	
5	<a href="#">Proposed runoff volumes (m<sup>3</sup>/ha)</a>	
6	<a href="#">Total required volume of attenuation (m<sup>3</sup>)</a>	
7	<a href="#">Detailed SuDS proposals (type, location, size)</a>	
8	<a href="#">Infiltration test results in accordance with BRE365 (if proposing infiltration)</a>	
9	<a href="#">Details of proposed flow controls (type, size)</a>	
10	<a href="#">Hydraulic calculations to show performance of the system up to the 1% AEP plus climate change storm event</a>	
11	<a href="#">Consideration of a surcharged outfall</a>	
12	<a href="#">Exceedance flow plan</a>	
13	<a href="#">Management / maintenance arrangements (including adopting body)</a>	
14	Formal agreement from third party if discharging into their system	

# 5 Technical Guidance

4.1.1 The following sections provide technical guidance on the aspects contained within the checklists in the preceding chapter. This is aimed at providing developers and their consultants with locally specific technical guidance to ensure their submissions are aligned with the expectations of the LLFA.

4.1.2 This section covers the following:

- Urban creep
- Existing drainage arrangements
- Proposed method(s) of surface water disposal
- Existing runoff rates
- Proposed runoff rates
- Existing runoff volumes
- Proposed runoff volumes
- Required volume of attenuation
- SuDS proposals
- Infiltration testing
- Detailed drainage layouts
- Flow controls
- Hydraulic calculations
- Surcharged outfalls
- Exceedance flow plans
- Management and maintenance

## 4.2 Urban Creep

4.2.1 Urban creep should be considered in any application to account for increases in impermeable surfaces throughout the lifetime of development (e.g. the addition of conservatories or building extensions). This should be limited to residential development only and use the allowances shown in Table 2 taken from the Local Authority SuDS Officer Organisation (LASOO) Practice Guidance.

Residential development density (dwellings per hectare)	Change allowance (% of impermeable area)
≤25	10
30	8
35	6
45	4
≥50	2
Flats and apartments	0

Table 2: Urban Creep Allowances

## 4.3 Existing Site Drainage Arrangements

### Greenfield sites

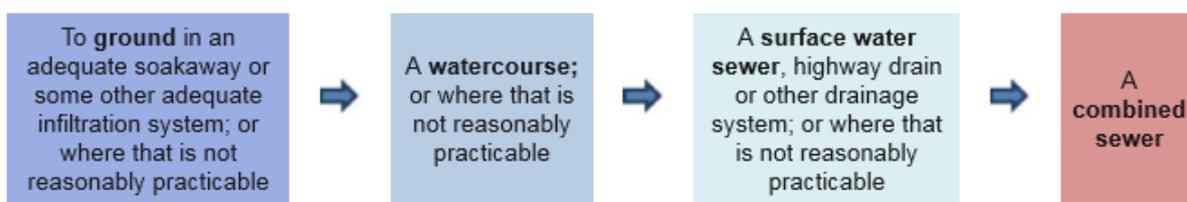
- 4.3.1 Detail should be provided on the natural contours of the land, flow paths and existing points of discharge. If there are multiple catchments within the site, these should be identified and retained following development unless it can be demonstrated that the alteration of catchments will provide betterment.

### Previously developed sites

- 4.3.2 As much detail as possible should be provided on the existing positive drainage system (if present). However as a minimum, details of the final outfall including its location and destination must be provided. If the site discharges into a third party asset such as an IDB drain under non-standard conditions (e.g. a higher rate of discharge), agreements outlining this should be provided within the report.

## 4.4 Proposed Method(s) of Surface Water Disposal

- 4.4.1 As required by the Building Regulations and PPG, surface water must discharge to the following, listed in order of priority:



### Infiltration

- 4.4.2 For an **outline** application, whilst we would prefer to receive infiltration test results, we appreciate that it is not always possible to undertake these and therefore we would accept a thorough desk-based assessment provided that a second viable option for surface water drainage is also proposed (e.g. to an adjacent watercourse).
- 4.4.3 When submitting a **full** application or discharging a surface water condition and infiltration is proposed, infiltration testing in accordance with BRE365 must be undertaken at representative locations and depths across the proposed development site. The results of infiltration testing will need to be submitted alongside the application for review. The minimum infiltration rate the LLFA accepts is  $1.0 \times 10^{-6}$  m/s. To protect groundwater from pollution, any infiltration structure must be shown to be constructed with the base set at a minimum of 1.0 m above the anticipated groundwater level. Information to support this could include trial pits or boreholes on site.
- 4.4.4 It is our view that deep soakaways (> 2 m below ground) or borehole soakaways do not meet the requirements of the first level of the hierarchy. Whilst in some cases they can provide important groundwater recharge, they do not mimic the natural drainage system as would shallow infiltration. These should only be considered as a final option for the disposal of surface water on a par with a sewer. If deep infiltration is the only feasible way to discharge surface water, we would expect the applicant to provide evidence they have agreed the strategy with the Environment Agency's groundwater team.

### Watercourse

4.4.5 If it is proposed to discharge into a watercourse within the site boundary this should be shown on a plan. We will require evidence that the watercourse itself has an outfall and is in a suitable condition to receive surface water. The lack of detailed information on these grounds may increase the level of uncertainty we have about the effectiveness of a drainage strategy. If this degree of uncertainty is great then as LLFA we would have grounds to object to the drainage proposal.

#### Surface Water Sewer

4.4.6 Any proposed connection to the public sewer will need agreement from Anglian Water. For an **outline** application, correspondence with the responsible body should be submitted to demonstrate agreement in principle to the discharge and connection point. Anglian Water may require local capacity improvements for sewer connections or a new sewer may need to be requisitioned to connect to the best point on the network. These should be negotiated with the sewerage undertaker directly.

4.4.7 For any **full** or **discharge of condition** application, correspondence with the responsible body agreeing to accept surface water at an agreed rate should be appended to the surface water drainage strategy.

4.4.8 For connections into highway drains, surface water may only be drained into the network through existing proven connections. Alternatively, the developer may upgrade the highway drainage system from the site to the outfall point to allow sufficient capacity.

#### Combined Sewer

4.4.9 Where a surface water connection to an existing combined sewer is unavoidable, it must be undertaken in such a manner and at such a location so as to facilitate future separation of the surface water from that combined system. As outlined above, for an **outline** application, correspondence with the responsible body should be submitted to demonstrate agreement in principle to the discharge and connection point. Anglian Water may require local capacity improvements for sewer connections or a new sewer may need to be requisitioned to connect to the best point on the network. These should be negotiated with the sewerage undertaker directly.

4.4.10 For any **full** or **discharge of condition** application, correspondence with the responsible body agreeing to accept surface water at an agreed rate should be appended to the surface water drainage strategy.

### 4.5 Existing Runoff Rates

4.5.1 We require calculations of the existing peak runoff rates (l/s/ha) for the following storm events:

- 100% Annual Exceedance Probability (AEP) (1 in 1)
- 3.3% AEP (1 in 30)
- 1% AEP (1 in 100) including a climate change allowance (see below)

4.5.2 Consideration should be given to sub-catchments that may exist on site and individual calculations should be provided per sub-catchment where appropriate.

### 4.6 Proposed Runoff Rates

4.6.1 We require the rate of runoff from a development to be restricted in line with the SuDS Non-Statutory Technical Standards.

- 4.6.2 All new developments on greenfield land are required to discharge the runoff from the impermeable areas at the same greenfield runoff rate, or less than, if locally agreed with an appropriate authority or as detailed within the local planning policies of District and City Councils. Where a **simple** flow control is proposed, the peak runoff rate should be limited to  $Q_{BAR}$  (mean annual flow rate). Where a **complex** flow control is proposed the peak runoff rate from the developed site for events up to and including the 1% AEP plus climate change event should not exceed the greenfield equivalents.
- 4.6.3 Brownfield (previously developed land) sites must reduce the existing runoff from the site as part of the redevelopment. Where possible, in order to provide betterment, redevelopments should look to reinstate greenfield runoff rates. Note that in some parts of Cambridgeshire there are specific policy requirements related to acceptable runoff rates for brownfield sites set out in Local Plans.
- 4.6.4 **IMPORTANT:** As outlined in the CIRIA SuDS Manual, the minimum outlet pipe acceptable for adoption by a sewerage undertaker is usually 75 mm. Sewers for adoption (7<sup>th</sup> edition) gives a minimum opening size for fixed control structures of 100 mm or equivalent. However, much smaller diameters may be acceptable for SuDS owned by other organisations, particularly for locations downstream of filtration devices where the risk of blockage is very small. The outlet diameter and associated risk of blockage should be considered on a site by site basis.
- 4.6.5 **NOTE:** Self cleansing velocity should be achieved for all pipes.

## 4.7 Existing Runoff Volumes

4.7.1 We require calculations of the existing peak runoff volumes ( $m^3/ha$ ) for the following storm events:

- 100% Annual Exceedance Probability (AEP) (1 in 1)
- 3.3% AEP (1 in 30)
- 1% AEP (1 in 100)

## 4.8 Proposed Runoff Volumes

- 4.8.1 Runoff volumes from the developed site will usually increase in comparison to the site in its natural condition; this may increase flood risk in natural receiving systems. Controlling the volume of runoff from the site is therefore vital to prevent flood risk in natural systems.
- 4.8.2 The volume should, where reasonably practicable be controlled, in accordance with the following.
- 4.8.3 **Greenfield Sites:** The runoff volume from the development site to any surface water body or sewer in the 1% AEP (1 in 100), 6 hour rainfall event should not exceed the greenfield runoff volume for the same event.
- 4.8.4 **Previously Developed Sites:** The runoff volume from the development site to any surface water body or sewer in the 1% AEP (1 in 100), 6 hour rainfall event must be constrained to a value as close to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the existing site. Where it is not reasonably practicable to constrain the volume of runoff, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

4.8.5 To achieve the above, long term storage may be required. Long Term Storage is the term given to the volume of temporary storage which needs to be provided for the additional volume of surface water runoff that is generated by the development that is greater than the volume of greenfield runoff. The greenfield runoff volume is calculated using the 1:100 year 6 hour event. This volume is the amount that can be discharged at the 1:100 year greenfield runoff rate. The additional runoff volume should be discharged from the site at a flow rate less than 2 l/s/ha for this event. As critical duration events for the design of the site storage system will be much longer than 6 hours, the Long Term Storage volume is not calculated using the 1:100 year 6 hour event, but needs to be assessed using the critical duration event.

#### 4.9 Required Volume of Attenuation

4.9.1 An assessment of the volume of attenuation storage that will be required on site is required. This should be based on the 1% AEP plus climate change storm event and allowable discharge rate for the site. The method and volumes of attenuation should be identified and located on a plan of the proposed development.

4.9.2 Expressing volumes in a comprehensible format such as m<sup>3</sup> per m<sup>2</sup> of developed site area for an outline application makes the approach to design more flexible and simplifies the evaluation process.

#### 4.10 Climate Change

4.10.1 All surface water drainage strategies are expected to incorporate the latest climate change allowances for rainfall intensity. Table 3 below provides an appropriate precautionary response to the uncertainty about climate change impacts on peak rainfall intensity.

	Total potential change anticipated for:		
	2010-2039	2040-2059	2060-2115
Upper End	10%	20%	40%
Central	5%	10%	20%

Table 3: Climate change allowances

4.10.2 The central estimate should be used for design purposes to assess the impact on surface water drainage networks. The upper end estimate should be used to assess the potential flood risk implications in the design rainfall event including whether there is any increased flood risk to third parties as a result of the development.

4.10.3 Where the lower climate change values (for 2010-2039 or 2040-2059) in Table 3 are used, we may ask for justification of the design life of the development to ensure that the correct climate change allowances are applied.

#### 4.11 SuDS Proposals

4.11.1 Surface water drainage systems should replicate natural drainage processes as closely as possible. SuDS such as permeable paving, swales, green roofs, attenuation basins and wetlands should be preferred on all development sites ahead of conventional piped drainage measures. Geocellular storage crates can be considered an element of SuDS however without other components (swales, filter drains or strips) they do not provide any water quality treatment.

4.11.2 Full design details of all SuDS features are contained within the Ciria SuDS Manual (C7530); however for ease, we have included some of the key design criteria (taken from the Ciria SuDS Manual (C7530)) that should be applied for the main SuDS features, in the following boxes.

### Infiltration Systems



- Effective upstream pre-treatment required to remove sediment and silt loads to prevent long-term clogging
- A minimum infiltration rate of  $1 \times 10^{-6}$  m/s
- A minimum distance of 1.2 m between the base of the infiltration system and the maximum likely groundwater level
- Side slopes of basins should not normally be any steeper than 1 in 3 to allow for vegetative stabilisation, mowing, access and for public safety. However this may be relaxed if the basin is very shallow (e.g. less than 500 mm deep)
- Discharge from full to half full should be within a reasonable time (24 hours for anything up to the 1% AEP event) so the risk of it not being able to manage a subsequent rainfall event is minimised

### Filter Strips

- Contributing area should have a shallow slope that falls towards the filter strip
- Minimum longitudinal slope of 1% to prevent ponding and a maximum slope of 5% to prevent flow channelling. Level spreaders to be used where slopes are >5%
- Maximum flows across filter strip of 1.5 m/s recommended to prevent erosion

## Permeable Paving



The design of permeable paving can vary significantly depending on the proposed use of the surface. Guidance should be sought from the manufacturer of the chosen permeable paving.

## Swales



- Should generally be designed with a trapezoidal or parabolic cross-section
- Base width should be between 0.5 – 2.0 m. For swale widths >2.0 m flow dividers may be required
- Longitudinal slopes should be constrained to 0.5-6% with check dams on slopes greater than 3%
- Underdrains required for swales with a slope >1.5% (unless wet swales proposed)
- A maximum side slope of 1 in 3 but 1 in 4 is preferred
- Minimum length of swale between culverts should be 5 m
- Normal swale depth of 400-600 mm
- Flow velocities kept below 1.0 m/s to prevent erosion

## Attenuation/Detention Basins



- Effective upstream pre-treatment required to remove sediment and silt loads to prevent long-term clogging or alternatively a forebay should be incorporated
- Maximum depth of water should not exceed 2 m in most extreme design event but a much lower maximum depth is desirable
- Base of basin should have a gentle slope (no more than 1 in 100) towards the outlet
- Recommended length/width ratio for on-line basins is between 3:1 and 5:1
- Side slopes should not exceed 1 in 3 unless special site and/or safety arrangements allow for steeper slopes

## Wetlands



- Should include a sediment forebay, a permanent pool, attenuation storage volume and aquatic benching
- Inlets and outlets placed to maximise flow through the facility
- Maximum depth of permanent pool should be a maximum of 1.2 m
- Maximum depth of attenuation storage should be 0.5 m above the permanent pool
- An aquatic bench should extend inwards from the normal pond edge with a maximum depth of 0.4 m below the normal pool water surface elevation

## 4.12 Infiltration Test Results

4.12.1 Infiltration testing to support the surface water drainage strategy will need to be undertaken in accordance with BRE365 guidance. The following provides good practice minimum requirements:

1. Minimum of 3 tests undertaken in quick succession at each location/trial pit
2. Lowest value obtained across the site to be used for calculating the required volume of soakaways
3. Depth of testing to be representative of drainage proposals (i.e. shallower tests for permeable paving and deeper tests for conventional soakaways)

4.12.2 The minimum infiltration rate the LLFA accepts is  $1.0 \times 10^{-6}$  m/s. **Please note that extrapolated results will not be accepted.**

## 4.13 Detailed Drainage Layout Plan

4.13.1 A detailed drainage layout plan should be fully labelled and show details (e.g. pipe numbers, gradients, diameters, locations and manhole details) of every element of the proposed drainage system (including all SuDS and pipes).

## 4.14 Details of Flow Controls

4.14.1 Details of the type and size of any flow controls (online or offline) should be included either with the report or on the detailed drainage layout plan.

## 4.15 Hydraulic Calculations

4.15.1 Calculations to show the performance of the system for a range of summer and winter storm durations from 15 minutes up to the 10080 minute (7 day) should be undertaken.

4.15.2 For the critical 3.3% AEP rainfall event there should be no above ground flooding

4.15.3 For the 1% AEP rainfall event including an allowance for climate change some short term above ground flooding may be permitted. Flood water should be managed to be safe and not enter any buildings or disrupt emergency access routes.

## 4.16 Surcharged Outfall

4.16.1 The standard default setting of many surface water computer modelling programmes assumes a freely discharging outfall. Careful consideration is required and evidence provided to demonstrate that this assumption is correct. In many circumstances an outfall maybe surcharged affecting its hydraulic capacity and impacting on the surface water network. A surcharged outfall is likely to occur if discharging into a watercourse or surface water network near capacity. In these scenarios, and with the absence of supporting information to the contrary, it is expected the surface water calculations will assume a surcharged outfall.

#### 4.17 Exceedance Flow Plan

- 4.17.1 If any above ground flooding is expected for the 1% AEP (1 in 100) rainfall event including an allowance for climate change, a plan showing the volumes, depths, velocities and extents should be mapped onto a topographical plan of the site (levels on the topographical plan should represent the post-development situation). If flooding is extensive the hazard should be considered in line with guidance from CIRIA's Design for Exceedance in Urban Drainage document.
- 4.17.2 Flows that exceed the design criteria must be managed in flow conveyance routes that minimise the risks to people and property both on and off site

#### 4.18 Management / Maintenance Arrangements

- 4.18.1 The management and maintenance of SuDS should appropriately account for the construction, operation and maintenance requirements of all components of the drainage system (surface and sub-surface). Applicants should sufficiently consider the likely maintenance requirements of new and existing infrastructure, over its design life including the provision of funding. It is important that maintenance is also considered in the design of the drainage system and the development site to account for the requirements of undertaking all stages of maintenance work such as ease of access whether this is for personnel, vehicles or machinery.
- 4.18.2 For **outline** and **full** applications we expect due consideration to have been given to potential organisations who may adopt / maintain the proposed surface water system and this should be outlined within the surface water drainage strategy.
- 4.18.3 When **discharging a surface water condition**, we will require evidence of who will be adopting/maintaining the drainage system for the lifetime of the development (in accordance with the Written Ministerial Statement, PPG and the SuDS Manual) alongside a management plan and maintenance schedule of work detailing the activities required. Appendix A has been provided for use as a template maintenance plan. We have also provided an example plan to show how it should be filled out.
- 4.18.4 Further guidance regarding the typical key operation and maintenance activities for each type of SuDS component are indicated in Table 32.1 of the Ciria SuDS Manual. Where ordinary watercourses or other surface water features are bounding or within the development site, these should also be included within a management plan and maintenance schedule. Where new properties are located adjacent to a watercourse, each property would have riparian owner responsibilities to undertake maintenance and this should be clearly highlighted to future property owners or tenants. An alternative is to provide other management arrangements for these features such as encompassing them in the responsibilities of any third party company established for the site. We recommend that at least a 10 m buffer should be allocated to an ordinary watercourse outside of IDB areas to allow for access for maintenance, in line with British Standards.
- 4.18.5 Where it is proposed that a community or private homeowners will be adopting SuDS (e.g. permeable paving within the curtilage of private dwellings), maintenance plans and schedules should be clearly communicated to any future property owners. This should be done in accordance with section 12 and 11.4 of British Standard BS8582:2013. Such plans should further explain the consequences of not carrying out the maintenance.

4.18.6 There are several options for adoption and maintenance of SuDS and include:

- **Anglian Water** will consider adoption of a scheme designed to their standards set out in their [SuDS Adoption manual](#)
- An **Internal Drainage Board** may consider adopting a drainage scheme associated with new development if the site falls within or adjacent to their IDB area.
- **Cambridgeshire County Council Highways Authority** will consider adoption of SuDS and drainage schemes which only drain a highway (not additional housing or open space areas). Further information can be found in the [Housing Estate Road Construction Specification](#).
- Adoption could also potentially be agreed through a Section 106 Agreement with the **District, Parish or City Council**. This could be combined with any public open space maintenance agreement.
- A **third party company** could be established to adopt and maintain a SuDS Scheme across the whole or part of a development.
- **Individual property owners** can become responsible for management and maintenance where it falls within their property boundary, however this would not cover any public or open space.

4.18.7 Many development sites are constructed on land which may have had an agricultural use. No dwelling should be constructed over an existing culvert that is to remain active and any field drains intercepted on the boundary of the development should be diverted so overall land drainage discharge can be maintained.

4.18.8 If diversion or changes to any watercourse are proposed, Land Drainage Consent will be required from Cambridgeshire County Council as LLFA or the Internal Drainage Board (where relevant).

5.1.1 In the following section we have included a list of standard conditions that we often use in our consultation responses. They cover most of the circumstances where conditions will be needed, but the list is not exhaustive. Some cases will require amendment of these conditions, or a completely new 'non-standard' condition to be drawn up.

### **SW1 Detailed Surface Water Scheme in line with Strategy**

Development shall not begin until a detailed surface water drainage scheme for the site, based on the agreed Flood Risk Assessment (FRA)/surface water drainage strategy [delete as appropriate] prepared by [SPECIFY] (ref: [SPECIFY] dated [SPECIFY] has been submitted to and approved in writing by the Local Planning Authority. The scheme shall subsequently be implemented in full accordance with the approved details before the development is completed.

### **SW2 Detailed Surface Water Scheme**

Development shall not begin until a surface water drainage scheme for the site, based on sustainable drainage principles, has been submitted to and approved in writing by the local planning authority. The scheme shall subsequently be implemented in accordance with the approved details before development is completed.

The scheme shall be based upon the principles within the agreed Flood Risk Assessment (FRA)/surface water drainage strategy [delete as appropriate] prepared by [SPECIFY] (ref: [SPECIFY] dated [SPECIFY] and shall also include:

- a. Full calculations detailing the existing surface water runoff rates for the QBAR, 3.3% Annual Exceedance Probability (AEP) (1 in 30) and 1% AEP (1 in 100) storm events
- b. Full results of the proposed drainage system modelling in the above-referenced storm events (as well as 1% AEP plus climate change) , inclusive of all collection, conveyance, storage, flow control and disposal elements and including an allowance for urban creep, together with an assessment of system performance;
- c. Detailed drawings of the entire proposed surface water drainage system, including levels, gradients, dimensions and pipe reference numbers
- d. Full details of the proposed attenuation and flow control measures
- e. Site Investigation and test results to confirm infiltration rates;
- f. Temporary storage facilities [applicable mainly for phased development];
- g. Details of overland flood flow routes in the event of system exceedance, with demonstration that such flows can be appropriately managed on site without increasing flood risk to occupants;
- h. Full details of the maintenance/adoption of the surface water drainage system;
- i. Measures taken to prevent pollution of the receiving groundwater and/or surface water;
- j. A timetable for implementation [applicable mainly for phased development];

The drainage scheme must adhere to the hierarchy of drainage options as outlined in the NPPF PPG

### **SW3 Detailed Surface Water Scheme with SuDS**

No development shall take place until a surface water drainage scheme for the site, based on sustainable drainage principles, has been submitted to and approved in writing by the local planning authority. The drainage strategy shall demonstrate that infiltration drainage is used where site-specific BRE365/CIRIA156 infiltration tests show it to be appropriate and if infiltration is not appropriate the scheme should demonstrate the surface water run-off generated up to and including the 1% Annual Exceedance Probability (AEP) rainfall event (including an appropriate allowance for climate change and urban creep) will not exceed the run-off from the undeveloped site following the corresponding rainfall event. The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.

#### **SW4 Construct Scheme in Accordance with Strategy**

The surface water drainage scheme shall be constructed and maintained in full accordance with the [SPECIFY] report as submitted (ref: [SPECIFY]) dated [SPECIFY]

#### **STRA Site Wide Strategy Required**

**1**

Prior to submission of the first reserved matters application involving buildings, roads or other impermeable surfaces, a strategic surface water drainage strategy for the site shall be submitted to and approved in writing by the Local Planning Authority. The scheme shall be based on the parameters set out in the Flood Risk Assessment (FRA)/surface water drainage strategy [delete as appropriate] or any subsequent, revised version that has first been approved in writing by the Local Planning Authority.

The scheme shall include phasing arrangements, details of primary infrastructure for each phase and plans for drainage asset operation, maintenance and contingency. The scheme shall set out what information, design parameters and design details will need to be submitted at the Reserved Matters stage for each phase of the development.

The development shall subsequently be implemented in accordance with the approved scheme.

#### **STRA Strategy for Future Reserved Matters Required**

**2**

Any reserved matters application shall include a detailed surface water strategy pursuant to the reserved matters site for which approval is sought. The strategy shall demonstrate how the management of water within the reserved matters application site for which approval is sought accords with the approved details of the strategic site wide surface water strategy. The strategy shall be based upon a SuDS hierarchy, as espoused by the publication 'The SuDS Manual CIRIA C753'. The strategy shall maximise the use of measures to control water at source as far as practicable to limit the rate and quantity of run-off and improve the quality of any run-off before it leaves the site or joins any water body.

The strategy shall include details of all flow control system and the design, location and capacity of all strategic SuDS features and shall include ownership, long-term adoption, management and maintenance schemes and monitoring arrangements/responsibilities. The strategy should also demonstrate that the exceedance of the designed system has been considered through the provision of overland flow routes.

The development shall be carried out in full accordance with the approved details and no building pursuant to that particular reserved matters site for which approval is being sought shall be occupied or used until such time as the approved detailed surface water measures have been fully completed in accordance with the approved details.

#### **STRA Construction Ahead of Development**

**3**

Prior to the commencement of any built development phase the associated surface water infrastructure works (including attenuation features, pipe work, controls and outfalls) shall be completed in accordance with the agreed site-wide drainage strategy, unless otherwise approved in writing by the Local Planning Authority

## **STRA 4 Temporary Surface Water Management**

4

Development shall not commence on any individual parcel/plot until a scheme for the temporary storage and management of surface water on that parcel/plot has been submitted to and approved in writing by the Local Planning Authority. The scheme shall subsequently be implemented in full accordance with the approved details.

### **M1 Residential Maintenance Plan**

Details for the long term maintenance arrangements for the surface water drainage system (including all SuDS features) to be submitted to and approved in writing by the Local Planning Authority prior to the first occupation of any of the dwellings hereby permitted. The submitted details should identify runoff sub-catchments, SuDS components, control structures, flow routes and outfalls. In addition, the plan must clarify the access that is required to each surface water management component for maintenance purposes. The maintenance plan shall be carried out in full thereafter.

### **M2 Non-Residential Maintenance Plan**

Details for the long term maintenance arrangements for the surface water drainage system (including all SuDS features) to be submitted to and approved in writing by the Local Planning Authority prior to the first occupation of any building. The submitted details should identify runoff sub-catchments, SuDS components, control structures, flow routes and outfalls. In addition, the plan must clarify the access that is required to each surface water management component for maintenance purposes. The maintenance plan shall be carried out in full thereafter.

### **M3 Implement Maintenance Plan**

Maintenance of the surface water drainage system (including all SuDS features) both during and following construction to be undertaken in full accordance with the approved management/maintenance plan prepared by [SPECIFY] (ref: [SPECIFY]), dated [SPECIFY]

### **I1 Infiltration Testing**

No development shall commence until infiltration testing has been undertaken in accordance with BRE365/CIRIA156 and a final surface water strategy based on the results of this testing has been agreed by the Local Planning Authority, in conjunction with the Lead Local Flood Authority

[National Planning Policy Framework](#)

[Planning Practice Guidance](#)

[Cambridgeshire Flood & Water SPD](#)

[BRE365 Digest](#)

[Building Regulations](#)

[Anglian Water Surface Water Policy](#)

[Ciria SuDS Manual](#)

[Ciria Designing for Exceedance](#)

[Written Ministerial Statement](#)

## 8 Abbreviations/Definitions

<b>AEP</b>	Annual Exceedance Probability
<b>BRE</b>	Building Research Establishment
<b>CCC</b>	Cambridgeshire County Council
<b>CIRIA</b>	Construction Industry Research and Information Association
<b>EA</b>	Environment Agency
<b>Ha</b>	Hectares
<b>IDB</b>	Internal Drainage Board
<b>l/s</b>	Litres per second
<b>l/s/ha</b>	Litres per second per hectare
<b>LASOO</b>	Local Authority SuDS Officer Organisation
<b>LLFA</b>	Lead Local Flood Authority
<b>LPA</b>	Local Planning Authority
<b>m<sup>3</sup>/ha</b>	Cubic metres per hectare
<b>NPPF</b>	National Planning Policy Framework
<b>PPG</b>	Planning Practice Guidance
<b>SPD</b>	Supplementary Planning Document
<b>SuDS</b>	Sustainable Drainage Systems

**Map of Drainage Maintenance Features** – Please colour code the drainage components in line with the maintaining body (example below).



Type of Structure (Swale, Infiltration basin, etc.)	Feature on Drainage Layout Drawing (Screenshot)	Maintenance Schedule (Regular, Occasional, Remedial, Monitoring)	Required Maintenance	Frequency	Maintaining Body (Adopting Body, Private Management Company,
Balancing Pond		Regular	Remove Litter and Debris	Monthly (or as required)	Private management company
		Occasional	Remove sediment from main body of pond when volume reduced to 20%	As required	
		Remedial	Repair erosion or other damage	As required	