



THE GUILDHALL

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Life Museum

Adoption Requirements

RIVER ISLAND

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Adoption Requirements

Specific drainage requirements for adoption

The drainage performance requirements are explained in detail in The SUDS Manual (CIRIA C697). The specific drainage requirements for each site will be specified by the Environment Agency via the normal planning consultation process. However, SUDS that are adopted by Cambridge City Council must as a minimum meet the following requirements from The SUDS Manual:

- Replicate natural drainage systems for a site as close as possible given the nature of a development. This is normally achieved by using source control and a management train. The management train provides different SUDS features that follow each other in sequence, gradually reducing the flows and volumes where possible and treating pollution in the water. This approach results in features that are located in public open space being protected from pollution. The Council may not adopt the source control part of the drainage system, but it must be in place to protect those parts that are adopted and will reserve the right not to adopt any down stream SUDS features should insufficient source control be in place.
- Prevent surface runoff from a site for small rainfall events up to 5mm (greater depth if possible) by allowing it to soak into the ground or evaporate back into the air. This will require the use of source control features that can allow partial infiltration or evaporation of water. Examples include swales and basins, permeable pavements, green roofs or engineered systems that meet the same requirements (e.g. rain-water harvesting, irrigation systems, etc.). This is called interception storage in The SUDS Manual (CIRIA C697).

- Limit the frequency of volume of runoff from extreme rainfall events to the greenfield frequency of runoff volume (this is called long term storage in The SUDS Manual (CIRIA C697) and is based on a rainfall event that has a 1% chance of happening each year). This can be achieved using a range of features including ponds, basins, permeable pavements and soakaways.

Rainfall terminology

There are two commonly used ways of expressing how frequently a particular depth or intensity of rainfall occurs

Annual probability (chance) of happening or being exceeded	Return period (often used by drainage engineers to denote the average time interval between rainfall events of a given size)
1%	1 in 100 year
3.33%	1 in 30 years
10%	1 in 10 years
50%	1 in 2 year

- Keep the rate of runoff from rainfall the same as would happen from a greenfield site (this is called attenuation storage in The SUDS Manual and the design is normally based on a rainfall event that has a 1% chance of happening in any one year). To limit liability for flooding, Cambridge will also require an additional 30% rainfall intensity to be applied to allow for climate change (typically also an Environment Agency requirement). This can be achieved using a range of features including ponds, basins, permeable pavements and soakaways.
- SUDS that are to be adopted by Cambridge must be robust to minimise future liabilities for the council. All drainage systems can be overwhelmed by unusual rainfall events. Developers will have to demonstrate that when this happens the water flows over the surface of the ground along routes that minimise the risk of flooding to buildings or other sensitive locations (these are known as overland flow routes).

An example of overland flow routes is to allow water to flow along roads to a lower point in the site. This is no different to current requirements for adoptable sewers.

- Low flow channels may be required to carry every day flows (i.e. a specific route for flows up to 1 in 1 year) to help maintain the high quality appearance of SUDS (for example to avoid the bottom of a basin becoming a large area of waterlogged ground).
- SUDS features must be as shallow as possible with gentle side slopes and shallow water depths. Large, deep ponds with steep sides are not acceptable.
- Vertical head walls, poorly designed rip rap and other visually obtrusive features will not be acceptable.
- Water level rises within any temporary storage areas should be kept to a minimum. Further information is provided for each feature.
- Outlet flow controls are a very important aspect of SUDS and should be provided on all features that are intended to store water to ensure the storage operates when required and flows to watercourses do not exceed agreed rates. The precise location should be considered on site specific basis (See Section 11 for more details).
- A safe exceedance or overflow route must be provided that directs flows away from buildings or other sensitive infrastructure.
- Any features that are to be adopted by Cambridge City Council must be designed in accordance with The SUDS Manual (CIRIA C697). Where there are conflicting requirements this guide shall take precedence.
- A flat area should be provided around features and inside when considering basins, to provide easy access for maintenance. This should be at least 2m wide. There should be access to the feature from a road for small tracked excavators. This requires suitable space and gradients but often does not require a specific hard surface.

- One of the most important aspects to ensure SUDS work properly is the design and maintenance of the outlet flow control. This will be site specific but Section 11 provides further information.

Specific treatment requirements for adoption

- The SUDS Manual requires sufficient treatment stages to be provided within a SUDS to remove pollution from runoff. The Environment Agency guidance in removing pollution from surface water (Pollution Prevention Guideline, PPG 3) recognises the importance of using SUDS to treat pollution in surface water runoff. SUDS will also help to meet some of the targets set by the European Water Framework Directive (which became UK law in December 2003) for improving the quality of rivers and streams.
- SUDS to be adopted by Cambridge must be part of a system that provides sufficient treatment stages to remove pollution from the runoff (the rain picks the pollution up from the road or car park surface). It is especially important that silt and pollution is removed before it reaches features such as ponds or wetlands that are to be adopted by the City Council.

SUDS treatment requirements

Runoff pollution content	Catchment characteristics	No of treatment stages or features
Low	Roofs, school playgrounds	1
Medium	Residential roads, parking areas, commercial zones	2
High	Refuse collection and industrial areas, loading bays, lorry parks, distributor roads and other highways	3

Taken from The SUDS Manual

The water in the left hand bottle in the picture below is runoff from a polluted surface. Subsequent bottles to the right are taken as the water flows through a SUDS management train of swales, ponds and wetlands, clearly showing the cleaning process.



These samples were taken from locations along a SUDS management train draining a heavily polluted runoff and show the gradual pollution removal by the treatment stages (courtesy Neil McLean of SEPA)

SUDS to be adopted by the City Council should be designed to be easy to maintain. This requires small and shallow SUDS features. Access should be provided to allow maintenance, including for any mechanical plant required. In most cases this only requires small tracked excavators and the main concern is with providing sufficient space and gradients. A surfaced track is not always necessary.

A checklist of adoption requirements is provided at Appendix D.

Specific pond adoption requirements

Specific Adoption requirements for Cambridge City Council are:

- Ponds should have varying permanent water depths to add interest and habitat but should not be more than 1,200mm deep. The water level must not rise more than 500mm during a 1 in 30 year or greater rainfall event.
- Slopes down to the water's edge must be as shallow as possible and will not exceed 1 in 3. This allows for successful vegetation establishment and safe public and maintenance access. Where spatial constraints prohibit the construction of slopes within the specified gradients, the City Council may approve the use of steeper profiles in some areas. The steeper slopes should be limited to less accessible areas of a pond.
- A shallow sloping area below the water line that leads to a shallow underwater bench to support emergent vegetation. This should be at a slope of 1 in 3 to an underwater bench with a depth of 150mm. Shallow profiles maximise the area of the pond's 'wet zone' and thus its biodiversity value. They also enable improved vegetation survival when water levels fluctuate and mean that bank stabilisation techniques such as coir rolls are unlikely to be necessary.
- Natural colonisation of the pond should be considered first before any planting schemes are devised. However, the overriding requirement is to prevent erosion as soon as the SUDS starts to drain water. This may require planting to be carried out. Where planting lists are used they should comprise native non-invasive species found naturally within 30km of Cambridge (plant list provided at Section 5). The City Council will require an agreement that should natural regeneration prove unsatisfactory after an approved period of time (usually 12 months), supplementary planting will be undertaken at the developer's expense.

- Providing water features are shallow and blend into the landscape then fencing should not generally be required to prevent access. Barrier planting preventing accidental access should be considered before fencing but is not always necessary. The use of fencing detracts from the amenity value and aesthetic quality of features and is a barrier to successful maintenance regimes. If fencing is required, it should be visually attractive and should be toddler proof but not prevent easy access by adults in case of emergencies.
- Liners should not be used except where required to stop water soaking into the ground. Examples include where it is necessary to create permanently wet areas or prevent contamination from known sources of pollution entering the ground. Where a liner is used it should be sufficiently robust to resist puncture and should be covered with a minimum of 300mm depth of mixed topsoil and subsoil including at the edges.
- Topsoil (150mm thick) should be applied to the banks between the permanent water level and maximum water level and also over the wet bench. This topsoil will feather down into the pond profile below the water level. Topsoil is not to be placed over the subsoil below the permanent water level beyond the wet bench. This approach is contrary to ecological best practice and the reason it is required is to help rapid and permanent establishment of vegetation to resist erosion.

Specific basin adoption requirements

Specific adoption requirements for Cambridge City Council are:

- The water level must not rise more than 1.000mm during a 1 in 30 year or greater rainfall event. It should drain down in 48 hours maximum.
- Slopes down to the bottom of the basin shall be as shallow as possible and will not exceed 1 in 3. This allows successful vegetation establishment and safe public and maintenance access. Where spatial constraints prohibit the construction of slopes within the specified gradients, the City Council may approve the use of steeper profiles in some areas. The steeper slopes should be limited to less accessible areas of a basin.
- Providing slopes are shallow and the water is only stored infrequently for a short time then fencing should not generally be necessary to prevent access. Indeed, basins can also be used as play areas. The use of fencing detracts from the amenity value and aesthetic quality of features and is a barrier to successful maintenance regimes. If fencing is required it should be visually attractive and should be toddler proof but not prevent easy access by adults in case of emergencies.
- The base and sides of infiltration basins (up to the maximum water level) should be covered with rootzone soil (or similar material) that is sufficiently permeable to allow water to soak through. This may also be considered in retention basins if a dry firm surface is required in the base. The rootzone must also have sufficient organic content to support the vegetation.
- Topsoil (150mm thick) should be applied to the banks and base of retention basins up to the maximum water level. This approach is contrary to ecological best practice but is necessary to aid rapid and permanent establishment of vegetation and so resist erosion of the basin.
- Liners for retention basins should not be used. Liners are not suitable for infiltration basins as they stop water soaking into the ground.

Specific swale adoption requirements

The adoption requirements for Cambridge City Council are:

- For health and safety reasons, swales should be as shallow as possible and side slopes should normally be less than 1 in 3. The maximum depth of a swale should normally be less than 450mm. This allows successful vegetation establishment and safe public and maintenance access. Where spatial constraints prohibit the construction of slopes within the specified gradients, the City Council may approve the use of steeper profiles in some areas. The steeper slopes should be limited to less accessible sides of a swale.
- Generally gullies should not be used to collect water and pass it into swales. This results in swales that are deeper than required, unsightly and less safe. Over the edge flow across a small filter strip or shallow inlets is preferred to achieve the maximum depth stated above.
- Sufficient cross over points should be provided where pedestrians will want to cross the swale. These can be small causeways or bridges to suit the location and landscape character.
- Where swales lead to ponds or basins it helps keep these shallower. It will also help prevent problems meeting shallow outfall points.
- The water level in a swale must not rise more than 150mm to 300mm during a 1 in 30 year or greater rainfall event (maximum depends on location with the lower depth appropriate in streets). Flows across filter strips rarely exceed 50mm depth.
- Providing swales are shallow and blend into the landscape then fencing should not generally be required to prevent access. However in street situations some form of fencing or bollards may be required to prevent vehicles parking in swales.

- Liners should not be used below swales except where required to stop water soaking into the ground. Examples include where it is necessary to prevent contamination from known sources of pollution entering the ground. Where a liner is used it should be sufficiently robust to resist puncture and should be covered with a minimum of 300mm depth of mixed topsoil and subsoil including at the edges.
- Topsoil (150mm thick) should be applied to swales and filter strips wherever water will be present, usually up to the maximum water level. This approach is contrary to ecological best practice and the reason it is required is to help rapid and permanent establishment of vegetation to resist erosion. For swales with a drain below them. the base will require covering with rootzone material.

In urban areas swales may have harder edge features to suit the surrounding landscape, but can still be shallow and have a flat bottom with vegetation in it.

Specific filter drain adoption requirements

Specific adoption requirements for Cambridge City Council are:

- Any filter drains that are to be adopted by Cambridge City Council must be designed in accordance with The SUDS Manual (CIRIA 697) and the Specification for Highway Works (Highways Agency). Where there are conflicting requirements this guide shall take precedence.
- Gullies should not be used to collect water and pass it into filter drains. This is likely to clog the filter drain. Over the edge drainage across a small filter strip or via some other source control feature that removes silt is necessary.
- Liners should not be used around filter drains except where required to stop water soaking into the ground. Examples include where it is necessary to prevent contamination from known sources of pollution entering the ground. Where a liner is used it should be sufficiently robust to resist puncture.

Specific canal adoption requirements

The adoption criteria for Cambridge City Council are:

- Canals, rills and other channels should have a maximum water depth of 150mm.

Specific Inlet adoption requirements

The adoption criteria for Cambridge City Council are:

- Inlets and outlets in the sloping sides of ponds, basins or swales should be chamfered pipes to suit the angle of the slope.
- Vertical headwalls in open spaces will not generally be acceptable.
- Control features such as orifices and weirs should be on the surface where possible. Where control structures are below ground they should be accessible for maintenance from the surface without the need for entry into chambers.
- There should be an overflow route around a control feature in case it becomes blocked.

Verification of construction

The City Council will require verification that any SUDS they are to adopt have been constructed in accordance with the agreed design and specification. Verification will take the form of developer supplied documentation and City Council inspection during construction.

Work shall not start on site until the planning authority case officer has formally approved the adoption design plans and specification in writing. Once in place, the City Council should be given at least two weeks notice of the start of construction of the development and should be provided with a programme of works. The Council should be notified of any significant changes to the program.

The SUDS construction should be carried out to the satisfaction of the City Council's SUDS Engineer, who shall be provided with free access at all reasonable times to any part of the SUDS works or other works that may affect the operation of the SUDS.

During construction the developer may be required to prove the thickness and type of any material or layer, if it has been covered prior to inspection. Any work that cannot be inspected because the appropriate notice has not been received will result in the work being re-opened for inspection and reinstated at no expense to the City Council.

A pre-excavation inspection will be required to ensure construction run-off is being adequately dealt with and will not clog constructed SUDS features or pollute downstream features.

The developer's consultant should also inspect the construction and materials used. The consultant should prepare a site inspection plan and verification report. This will be site specific but as a minimum it will be expected to include the following:

- Photographs of excavations, confirmation of soil conditions, confirmation of levels, profiles and general earthworks.
- Photographs and full manufacturer's details (if appropriate) of inlets, outlets and any control structures associated with any feature to be adopted.
- Confirmation of topsoil sources with appropriate certificates.
- Full planting list and confirmation of plant sources, planting method statement and initial maintenance regime.
- Confirmation of subsoil and topsoil depths.
- Confirmation of gravel fill specification and sources, installation method statement of filter drains.
- Confirmation of source and test certificates for membrane liners if used. Membranes shall have welded joints and shall be inspected and the joints tested after installation. Records of the tests shall be provided.

- Photographs of the feature before and after planting.
- Full as constructed drawings and a topographical survey of the 'as constructed' feature.
- Confirmation of initial maintenance regimes.

The City Council will require a maintenance period of one year after completion of the whole development served by a SUDS. During this period the provision for a review of the performance of the SUDS features to allow minor adjustments and refinements based on observed performance should be provided. Any adjustments made will be at the developer's expense. At the end of the maintenance period there will be a final inspection. Any accumulated silt will have to be removed at this time and any areas of erosion or other defects repaired.

The City Council reserves the right to decline the adoption of any system that is not designed in accordance with the essential adoption requirements and where construction is not verified as detailed within this document.

Health and safety

The City Council will generally require SUDS ponds to be small and shallow with gentle side slopes which should also minimise health and safety risks. However, all proposals should accord with the requirements of the Construction, Design and Management Regulations 2007. This requires hazards to be removed by design wherever possible rather than providing mitigation to manage risk. For example, a pond designed to the principles of this guide (shallow, gentle slopes, wet benches) minimises the hazard and is better than a large deep pond, with steep side slopes that requires a fence to make it safe.

Child safety must be considered in pond and wetland design. This is best dealt with by measures mentioned in the guide such as shallow slopes, minimising water bodies of any depth and the use of peripheral planting. Larger fences cause their own safety problems (ease of access for rescue is hindered and they attract older children to climb over them) and are not recommended. However, where very young children up to the age of five years are likely to be present, and could potentially be unsupervised, a low toddler proof fence may be considered, that is sufficiently low to allow adults to get over it quickly.

Written evidence prior to construction will be required to demonstrate that all necessary health and safety risk assessments of the proposals have been undertaken by the developer and their advisors. Such risk assessments should consider all work phases, including construction, long term maintenance work and risks to the public during operation.