



# Inlets, outlets and controls

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## Description

Inlets, outlets and controls are key elements of a well designed SUDS. They allow water to flow into and out of features and also limit the rate at which water flows along and out of the system. There are many different variations available and they can easily be designed to add interest to the urban landscape.



*Stainless steel outlet leading to a surface rill*

## How they work

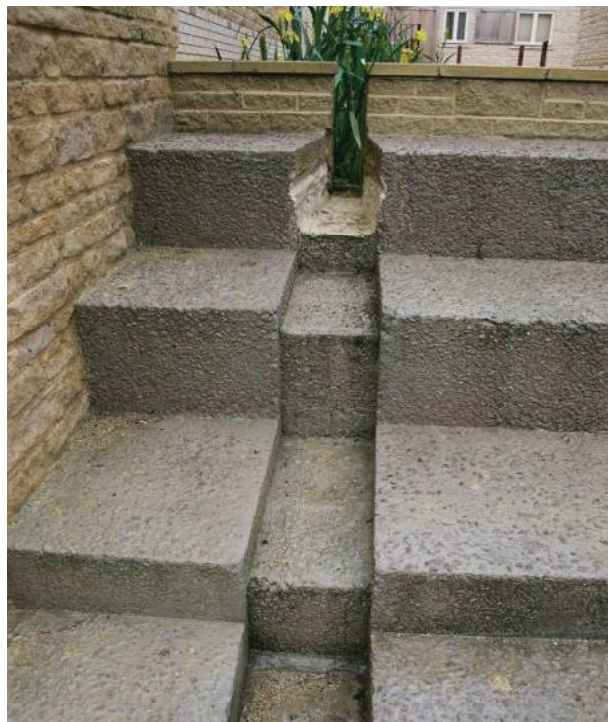
Control structures are restrictions in a pipe or other outlet that limit the rate at which water can leave a SUDS feature. As it rains, the water backs up and thus fills the storage area (pond, basin, swale, etc.). Without control structures the water would simply flow through the system and the ponds, basins and other features would not fill.

## Cambridge specific design considerations

The overriding design considerations for inlets, outlets and controls are ease of access and maintenance. This leads to a preference for surface control structures such as simple orifices (small diameter holes) or slot weirs, rather than those located below ground and out of sight in inspection chambers or manholes. Such underground features are more difficult to maintain and are often forgotten about.

In a well designed SUDS with source control, the rate of water flow should be much lower than in a normal drainage system that allows unrestricted discharge. This means that the velocity of the water is much lower and the risk of erosion is significantly reduced. Thus large erosion control features and vertical headwalls are not required, (vertical headwalls also have potential health and safety issues and are unsightly).

For shallow systems, where there is a limited depth of water storage, simple orifice controls are often the most suitable form of control.



*Slot weir outlet from a canal*



*Dropped kerb inlet to rain garden*



*Slot weir outlet with steel plate to disperse water and debris guard behind*



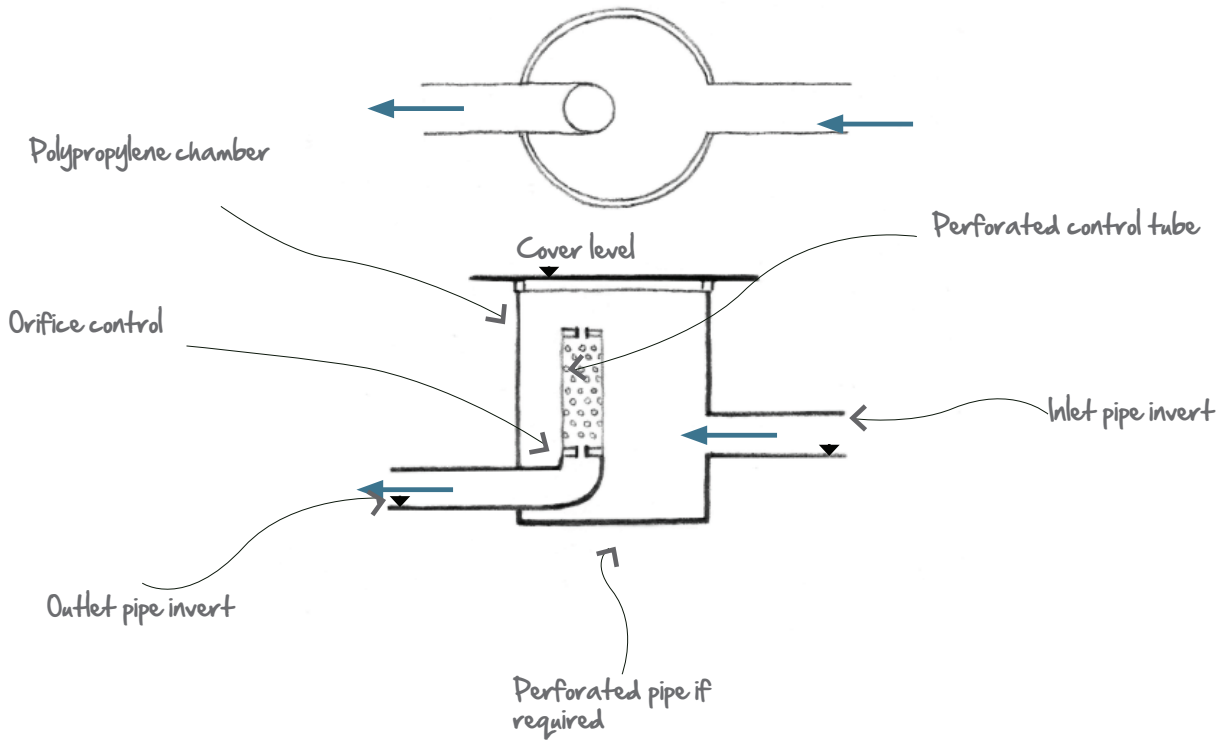
*Orifice control to a basin located on the surface so that it is easily accessible*



*Shallow geocellular storage used below permeable paving as a subbase replacement*



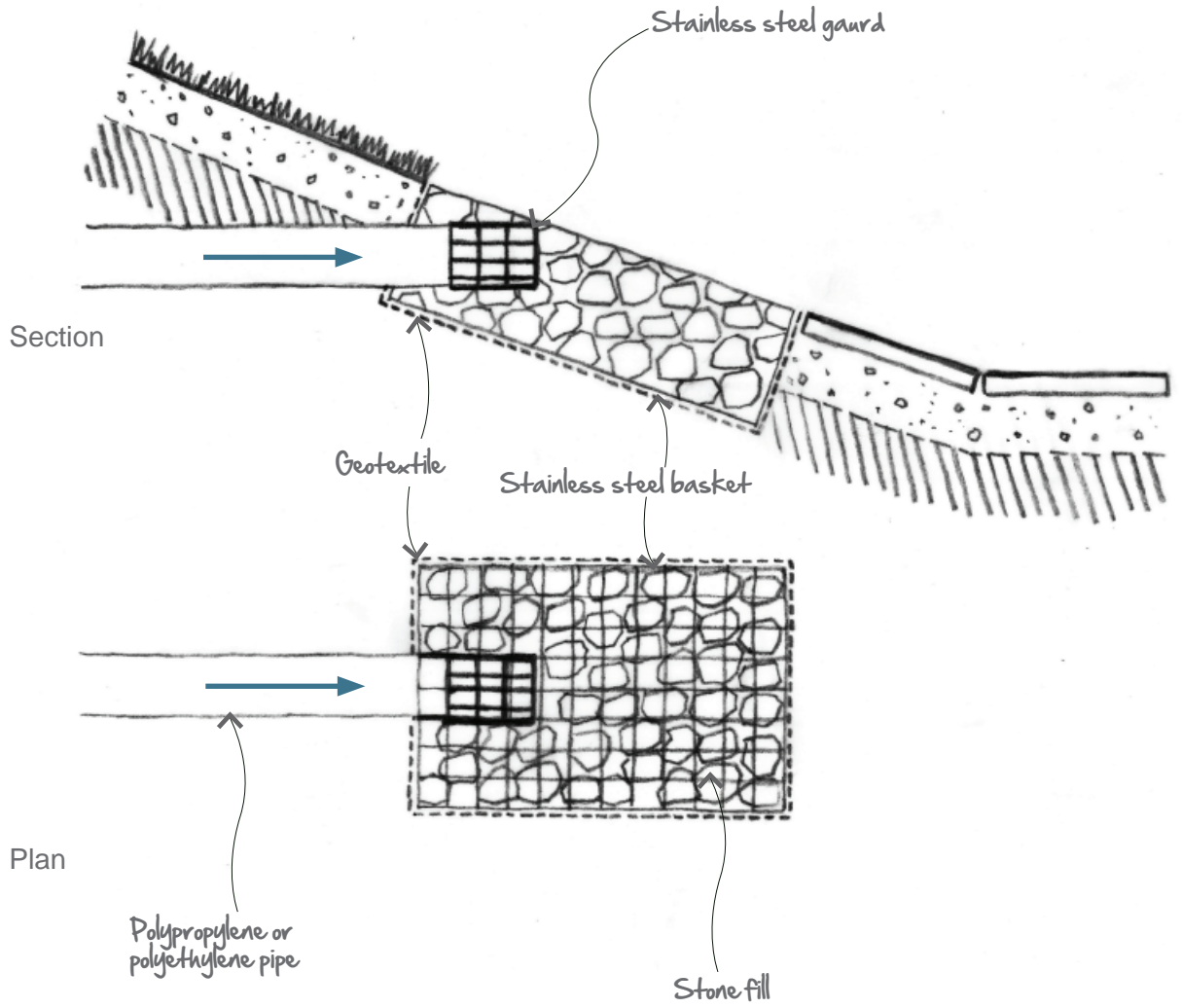
*Overflow outlet from a pond*



Perforated riser pipe detail (horizontal tube)



Perforated riser pipe to protect an orifice control in a chamber (see diagram above)



Basket or gabion inlet detail



Gabion inlet shortly after construction (see diagram above)

## Maintenance requirements

Routine maintenance of inlets, outlets and controls involves a monthly inspection to make sure they are clear and not obstructed. Any debris, litter, etc. that has accumulated will require removal. The cost of doing this will normally be included in the cost for visiting a site to carry out other maintenance work.



*Outlet from a small urban SUDS water feature*