

D Sustainable Urban Drainage (SUDS)

Sustainable Drainage Techniques (SUDS) aim to mimic natural drainage processes so that new developments do not increase surface water runoff and impact water quality (which is a general consequence of conventional drainage techniques). Although the consideration of SUDS is a requirement of all new developments, these make up only a fraction of the urbanised area of the UK. There are many opportunities for retrofitting SUDS within existing green and urban spaces to create appealing spaces whilst actively mitigating flooding and water quality problems.

It should also be noted that with regards to SUDS and surface water drainage, the Flood and Water Management Act 2010 calls for the establishment of a SUDS Approving Body (SAB) to be set up in county, county borough or unitary local authorities. The SAB is responsible for the approval and adoption of SUDS which must meet the National Standards for sustainable drainage.

There are various SUDS techniques available, many of which are applicable in different situations. SUDS are one element of the concept of Green Infrastructure, an approach which analyses and values the services provided by green spaces, in particular within urban areas. Current best practice is generally considered to be the CIRIA SUDS manual (CIRIA, 2007), it provides a comprehensive overview of the techniques. Examples of these are listed below:

- **Green Roofs** can vary in type from Roof Gardens, Roof Terraces, Green Roofs and Green Walls. This SUDS technique utilises plants and their substrate to provide temporary storage of rainfall and minimise runoff from roof areas. They can also offer additional biodiversity benefit. Rainwater harvesting techniques, such as the installation of water butts, can aid in increasing the attenuation of rainfall and contribute to the on-site recycling of water.
- **Water Butts** can vary in size and are used to collect and store rain water runoff, typically from rooftops via rain gutters.
- **Infiltration devices** drain water directly into the ground. They may be used at source or the runoff can be conveyed in a pipe or swale to the infiltration area. They include soakaways, infiltration trenches and infiltration basins as well as swales, filter drains and ponds. Infiltration devices can be integrated into and form part of the landscaped areas.
- **Filter Strips** are vegetated areas that function by slowing runoff velocities and filtering out sediment and other pollutants, and providing some infiltration into underlying soils. This approach to SUDS also provides scope for the creation of wildlife habitats and biodiversity gain.
- **Permeable Pavements** such as permeable concrete blocks, crushed stone and asphalt will allow water to infiltrate directly into the subsoil before soaking into the ground.
- **Basins and ponds and rainwater gardens** enhance flood storage capacity by providing temporary storage for storm water through the creation of landscape features within a site (which can often provide opportunities for the creation of wildlife habitats). Basins, ponds and wetlands can be fed by swales, filter drains or piped systems. In some instances, storm water runoff from a development can feed a pond which overflows into a vegetated wetland area to act as a natural soakaway. Rainwater gardens are depressions into which surface water is channelled, planted with water-loving species. They can be used in private gardens as well as on roadside verges.
- **Fringe Interception** of runoff could reduce the volume of surface water entering the urban sewers. Surface water runoff attenuated could be attenuated in detention basins or through alternative land management practices.