**By:** Max Tant, Flood Risk Management Officer

**To:** Floods and Water Resources Committee

**Subject:** Sustainable Drainage Systems

**Classification:** Unrestricted

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## 1. Introduction

Sustainable Drainage Systems (SUDS, sometimes SuDS)[1] are surface water management practices and flow controls designed to manage runoff from rainwater in a manner similar to natural processes. These techniques reduce the likelihood of flash flooding and result in greatly improved water quality.

At their crudest SUDS simply discharge water at the same rate as it would discharge from natural land, this rate is known as greenfield runoff, which requires storage for the excess water and a flow control device to limit the discharge.

Ideally, though, SUDS, would use more natural processes to store and discharge water, for instance ponds, wetlands and areas of green space. These SUDS also provide water quality benefits by filtering sediments and contaminants, amenities for the local environment and ecological habitats.

SUDS are not used for sewage or grey water (although there are sustainable means of managing these).

## 2. Rationale

SUDS aim to reduce the negative impacts that arise from the conventional management of surface water. Traditional drainage is designed to move rainwater as rapidly as possible from the point at which it has fallen to a discharge point, either a watercourse or soakaway.

This approach has a number of harmful effects:

- Run-off from hard paving and roofing can increase the risk of flooding downstream, as well as causing sudden rises in water levels and flow rates in watercourses.
- Many conventional drainage systems discharge into sewers that eventually flow into a combined sewer. These rarely have capacity to carry flows from the whole catchment in extreme events. Overflows from these sewers carry sewage, causing a public health issue.
- Surface water run-off can contain contaminants such as oil, organic matter and toxic metals. Although often at low levels, cumulatively they can result in poor water quality in rivers and groundwater, affecting biodiversity, amenity value and potential water abstraction. After heavy rain, the first flush is often highly polluting.
- By diverting rainfall to piped systems, water is stopped from soaking into the ground, depleting ground water and reducing flows in watercourses in dry weather.

As a result, many urban watercourses are lifeless and unattractive, and are often hidden in culverts under the ground, whilst the areas around them are prone to flash flooding without warning.

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[1] The U does not stand for Urban and it can still be capitalised.

# 3. SUDS Techniques

## *3.1. Source control*

Source control techniques aim to absorb or intercept rainwater runoff at or very near to its source, thus preventing runoff from passing down stream. These techniques include:

- Green or brown roofs – roofs with soil (that may be relatively thin) which absorb rain water that is evaporated later.
- Unpaved areas – not using impermeable surfaces or discharging runoff from impermeable surfaces to unpaved areas.
- Rainwater harvesting – roof water is intercepted and stored in tanks for use in domestic or commercial processes.

## *3.2. Filter Strips and Swales*

Filter strips and swales are vegetated surface features that drain water evenly off impermeable areas. Both devices mimic natural drainage patterns by allowing rainwater to run in sheets through vegetation, slowing and filtering the flow.

Swales are these are long shallow ditches that can be designed for a combination of conveyance, infiltration, detention and treatment of runoff.

Filter strips are gently sloping areas of ground that can be used for conveyance, infiltration and treatment.

Excess water from these features will usually be conveyed to one of the following features.

## *3.3. Permeable surfaces*

Permeable surfaces allow water to filter through them to a storage medium below or where the surface needs to be impermeable (for traffic loading reasons) it can runoff to a filter drain alongside the surface.

The water is stored in a volume of permeable material below the surface, it may infiltrate to the ground below or discharge to a local watercourse or sewer at an appropriate rate.

## *3.4. Infiltration*

Infiltration techniques collect water and use the natural properties of the local soil to discharge the water as it would if it had fallen on undeveloped land. Infiltration can be utilised by many drainage features:

- Soakaways – these are similar to conventional soakaways but include filtration material to improve water quality
- Basins – these are landscaped areas that fill with rain and slowly discharge until they are dry.
- Ponds – these are similar to basins but always contain some water for ecological or amenity purposes, they need to be designed appropriately to prevent them from drying.
- Underground storage – this may either be via oversized pipes that are perforated or stormcells (similar to milk crates) that receive water.

The water may be collected by conventional pipes that discharge to one of these features or it may be collected by swales that themselves have infiltration potential and the excess is discharged to these.

## *3.5. Attenuation*

Where infiltration is not possible water can be stored and discharged at an appropriate rate either into a local watercourse or to a sewer. Attenuation features take the same basic forms as infiltration techniques (except for soakaways) but rely on a surface feature to receive the discharge.

### Background documents

CIRIA SUDS Manual

### Author contact details

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**Appendix 1**

## Kent Flood Partnership Partners and Terms of Reference

Kent County Council
Medway Council
Environment Agency
Southern Water
Thames Water
Medway IDB
River Stour IDB
Romney Marshes IDB
Ashford Borough Council
Canterbury City Council
Dartford Borough Council
Dover District Council
Gravesham Borough Council
Maidstone Borough Council
Sevenoaks District Council
Sevenoaks District Council
Shepway District Council
Swale Borough Council
Thanet District Council
Tonbridge & Malling Borough Council
Tunbridge Wells District Council
Kent Highways Services
KCC Emergency Planning