



## SUDS Techniques – Hydraulic, Structural and Water Quality Issues

Science Summary P2-261/20/SS (SC020086)

This technical report builds on existing guidance on sustainable drainage systems (SUDS) available from CIRIA<sup>(1)</sup>, outlining the latest information on how to successfully design and construct SUDS. It provides a better understanding of the hydrological, hydraulic, structural, water quality and ecological issues of various sustainable drainage systems (SUDS) features, based on the information currently available in the UK and overseas.

The report discusses critical issues that must be considered when designing, constructing and maintaining SUDS schemes to effectively manage rainwater runoff from development sites. It is intended for use by clients, landscape architects, consulting engineers, local authorities, architects, highway authorities, planners, environmental regulators, contractors, developers, sewerage undertakers and other organisations involved in the provision or maintenance of surface water drainage to new and existing developments.

The first part of the report covers general information on all SUDS techniques. The second part contains detailed explanations of the design and performance of each technique.

### Part 1

*Section 1 (Introduction)* covers the concept of SUDS and discusses how the concept was developed to deal with the management of surface water runoff. It identifies the relationship between this report and publications from CIRIA and other organisations.

<sup>(1)</sup> *Sustainable Drainage Systems:*  
– *design manual for England and Wales*  
– *best practice manual*  
*Source control using constructed pervious surfaces*

*Section 2 (SUDS concepts)* identifies the management train concept, discusses the integration of SUDS into site design and introduces the different techniques that are available. It gives information on the use of SUDS on brownfield sites (or sites where there is natural contamination present) and also looks at the use of SUDS in conjunction with rainwater harvesting schemes.

*Section 3 (Stormwater pollution)* deals with stormwater pollutants that are either discharged to watercourses and sewers or infiltrate into the ground from SUDS schemes. It looks at the mechanisms and processes that occur within SUDS to improve water quality. It also identifies legislation that applies and the issues to be addressed in order to avoid causing pollution of either surface or groundwater. It describes how different combinations of techniques can be assessed to give the optimum efficiency for the management train.

*Section 4 (Rainfall and runoff)* is concerned with the assessment of greenfield runoff rates and runoff from developed sites. It also identifies the different criteria that should be considered when designing SUDS. This approach requires consideration of runoff from events with a range of annual probabilities (or return periods) and also requires careful consideration of overland flow routes during events that exceed the design criteria of the system (also known as flood routing).

*Section 5 (General SUDS design)* discusses the general design issues that relate to all SUDS features, including the make up of design teams, guidance on the choice of techniques to meet site specific constraints and design information. It also explains how SUDS may be designed to maximise environmental benefits and to meet the required health and safety standards.

*Section 6 (Construction of SUDS)* includes information on the education of site staff and how the construction programme may need to be changed to allow for the SUDS. It also recommends an independent inspection regime during construction.

*Section 7 (Management)* provides information on the maintenance regimes required.

*Section 8 (Economics of SUDS)* discusses the factors that should be included in any cost analysis of SUDS.

## **Part 2**

*Section 9 (Technical data for SUDS techniques)* provides an in depth discussion of the performance for each individual SUDS technique and provides best practice guidance for the design, construction and operation of SUDS. Each section includes an evaluation of the advantages and disadvantages of each technique, information on pollutant removal and hydraulic behaviour and design criteria.

A number of techniques are included in this section which are not incorporated in the CIRIA SUDS design manuals. These include green roofs and bioretention, as well as a greater emphasis on rainwater harvesting and reuse.

A series of appendices provide case studies, checklists and decision support flow charts.

Further related information on SUDS will be found on the CIRIA web site, [www.ciria.org/suds](http://www.ciria.org/suds)

This summary relates to information from Science Project P2-261/20 (SC020086), reported in detail in the following output:

**CIRIA Report C609 (referenced as P2-261/20/TR)  
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