Interim Code of Practice for Sustainable Drainage Systems

National SUDS Working Group
July 2004

Office of the Deputy Prime Minister
Creating sustainable communities

defra
Department for Environment Food and Rural Affairs

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

This Interim Code of Practice for SUDS has been developed in consultation with:

Office of the Deputy Prime Minister

Creating sustainable communities

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

CIWEM

The Chartered Institution of Water and Environmental Management

sharing knowledge
building best practice

Local Government Association

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Feedback arrangements and further copies

Technical queries and feedback should be referred to <www.ciria.org/suds/icop.htm>.

Further copies of the document and electronic versions of the model agreements that accompany the Interim Code of Practice for SUDS can be downloaded from CIRIA's SUDS website <www.ciria.org/suds/icop.htm>.

Summary

The Interim Code of Practice provides a strategic approach to the allocation of maintenance for Sustainable Drainage Systems in England and Wales. The Interim Code of Practice has been developed in conjunction with a set of model agreements allocating responsibilities for maintenance and refers practitioners to detailed technical guidance rather than duplicating information.

Acknowledgements

National SUDS Working Group	The development of the Interim Code of Practice was guided by a steering group, which comprised:	
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Scope

This Interim Code of Practice for Sustainable Drainage Systems (SUDS) aims to facilitate the implementation of sustainable drainage in developments in England and Wales by providing model maintenance agreements and advice on their use. It provides a set of agreements between those public organisations with statutory or regulatory responsibilities relating to SUDS.

The specific objectives of this document are to:

- encourage the implementation of SUDS in new and existing developments
- provide basic guidance for practitioners on the implementation of SUDS in new developments
- make the adoption and allocation of maintenance for SUDS more straightforward.

Production of this Interim Code of Practice is part of a wider range of actions being pursued to ensure that the potential of sustainable drainage systems to offer cost-effective solutions is fully exploited. It has been developed in consultation with:

- Office of the Deputy Prime Minister
- Department for Environment, Food and Rural Affairs
- Department for Transport
- Welsh Assembly Government
- Office of Water Services
- Water UK
- House Builders Federation
- Local Government Association
- English Nature
- Environment Agency
- Planning Officers' Society
- CIRIA
- County Surveyors' Society

It is anticipated that approval of certain sections of this Interim Code of Practice for SUDS, under Regulation 21 of the Groundwater Regulations 1998, will be sought from Defra ministers when a finalised edition of the Groundwater Regulations Code is published following full public consultation.

Defra involvement in the preparation of this Interim Code of Practice for SUDS is on the basis that this is an interim version and does not prejudice any future decisions Ministers may need to take in relation to individual cases.

Electronic versions (MS Word 97-2002) of the model agreements that accompany the Interim Code of Practice can be found on CIRIA's SUDS website <www.ciria.org/suds/icop.htm>.

RELATIONSHIP TO OTHER GUIDANCE

This document provides a strategic approach to the allocation of responsibilities for the maintenance of sustainable drainage systems and refers practitioners to detailed technical guidance. Numerous organisations have undertaken research into SUDS and CIRIA have produced several SUDS guidance documents (Figure A).

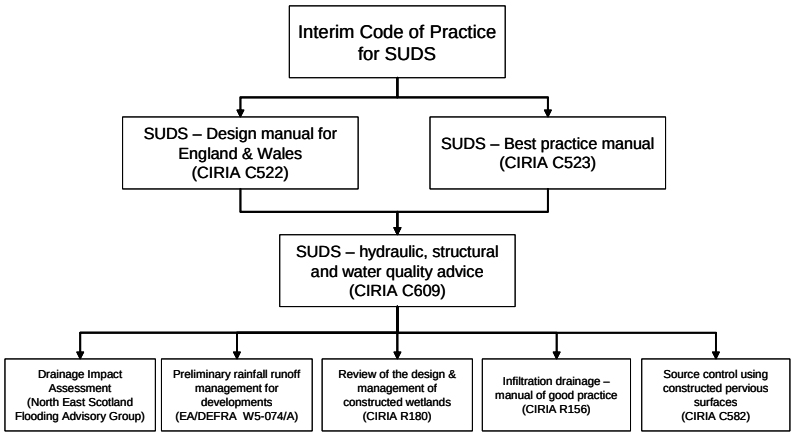

Figure A *Relationship of Interim Code of Practice with SUDS design guidance*

The Interim Code of Practice does not duplicate the information contained in these reports but provides appropriate references. Related SUDS guidance includes:

Sustainable urban drainage systems – design manual for England and Wales, CIRIA publication C522 (Martin *et al*, 2000b). Provides guidance on the technical issues surrounding urban drainage systems.

Sustainable urban drainage systems – best practice manual, CIRIA publication C523 (Martin *et al*, 2001). Provides good practice guidance in the use of SUDS and addresses issues surrounding their use.

Source control using constructed pervious surfaces, CIRIA publication C582 (Pratt *et al*, 2002). Provides technical detail on the design and construction of pervious pavements used for source control.

Sustainable drainage systems – hydraulic, structural and water quality advice, CIRIA publication C609 (Wilson *et al*, 2004). Technical review of existing information on sustainable drainage systems.

Model agreements for sustainable water management systems. Model agreements for SUDS, CIRIA publication C625 (Shaffer *et al*, 2004). Provides detailed guidance on the approach to securing long-term maintenance for SUDS and includes model agreements for maintaining SUDS through the planning process and a private SUDS model agreement.

CIRIA also manages and regularly updates a SUDS website <www.ciria.org/suds> which provides free information on SUDS and links to other SUDS-related websites.

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Attenuation	Reduction of peak flow and increased duration of a flow event.
Balancing pond	A pond designed to attenuate flows by storing runoff during the peak flow and releasing it at a controlled rate during and after the peak flow has passed. The pond always contains water. Also known as a wet detention pond.
Biodegradation	Decomposition of organic matter by micro-organisms and other living things.
Bioretention area	A depressed landscaping area that is allowed to collect runoff so it percolates through the soil below the area into an underdrain, thereby promoting pollutant removal.
Brown roof	A roof that incorporates a substrate (laid over a waterproof membrane) that is allowed to colonise naturally. Sometimes referred to as an alternative roof.
Catchment	The area contributing surface water flow to a point on a drainage or river system. Can be divided into sub-catchments.
Combined sewer	A sewer designed to carry foul sewage and surface water in the same pipe
Controlled waters	Waters defined and protected under the Water Resources Act 1991. Any relevant territorial waters that extend seaward for 3 miles from the baselines, any coastal waters that extend inland from those baselines to the limit of the highest tide or the freshwater limit of any river or watercourse, any enclosed dock that adjoins coastal waters, inland freshwaters, including rivers, watercourses, and ponds and lakes with discharges and groundwaters (waters contained in underground strata). For the full definition refer to the Water Resources Act 1991.
Curtilage	Land area within property boundaries.
Detention basin	A vegetated depression, normally is dry except after storm events, constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.
Diffuse pollution	Pollution arising from land-use activities (urban and rural) that are dispersed across a catchment, or sub-catchment, and do not arise as a process effluent, municipal sewage effluent, or an effluent discharge from farm buildings.
Evapotranspiration	The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.
Extended detention basin	A detention basin in which the runoff is stored beyond the time normally required for attenuation. This provides extra time for natural processes to remove some of the pollutants in the water.
FEH	*Flood estimation handbook*, produced by Centre for Ecology and Hydrology, Wallingford (formerly the Institute of Hydrology)
Filter drain	A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.

Filter strip	A vegetated area of gently sloping ground designed to drain water evenly off impermeable areas and to filter out silt and other particulates.
Filtration	The act of removing sediment or other particles from a fluid by passing it through a filter.
First flush	The initial runoff from a site or catchment following the start of a rainfall event. As runoff travels over a catchment it will collect or dissolve pollutants, and the "first flush" portion of the flow may be the most contaminated as a result. This is especially the case for intense storms and in small or more uniform catchments. In larger or more complex catchments pollution wash-off may contaminate runoff throughout a rainfall event.
Flood plain	Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions (see Environment Agency's *Policy and practice for the protection of flood plains* for a fuller definition).
Flood routeing	Design and consideration of above-ground areas that act as pathways permitting water to run safely over land to minimise the adverse effect of flooding. This is required when the design capacity of the drainage system has been exceeded.
Flow control device	A device used to manage the movement of surface water into and out of an attenuation facility, eg a weir.
Greenfield runoff	This is the surface water runoff regime from a site before development, or the existing site conditions for brownfield redevelopment sites.
Green roof	A roof with plants growing on its surface, which contributes to local biodiversity. The vegetated surface provides a degree of retention, attenuation and treatment of rainwater, and promotes evapotranspiration. Sometimes referred to as an alternative roof.
Groundwater	Water that is below the surface of ground in the saturation zone.
Highways Agency	The government agency responsible for strategic highways, ie motorways and trunk roads
Highway authority	A local authority with responsibility for the maintenance and drainage of highways maintainable at public expense.
Highway drain	A conduit draining the highway. On a highway maintainable at the public expense it is vested in the highway authority.
Impermeable	Will not allow water to pass through it.
Impermeable surface	An artificial non- porous surface that generates a surface water runoff after rainfall.
Infiltration (to a sewer)	The entry of groundwater to a sewer.
Infiltration (to the ground)	The passage of surface water into the ground.
Infiltration basin	A dry basin designed to promote infiltration of surface water to the ground.
Infiltration device	A device specifically designed to aid infiltration of surface water into the ground.
Infiltration trench	A trench, usually filled with permeable granular material, designed to promote infiltration of surface water to the ground.
Interim Code of Practice	An agreed provisional document within the existing legislative framework that establishes good practice.
Lagoon	A pond designed for the settlement of suspended solids.

Lateral drain	(a) That part of a drain which runs from the curtilage of a building (or buildings or yards within the same curtilage) to the sewer with which the drain communicates or is to communicate; or (b) (if different and the context so requires) the part of a drain identified in a declaration of vesting made under section 102 or in an agreement made under section 104.
Model agreement	A legal document that can be completed to form the basis of an agreement between two or more parties regarding the maintenance and operation of sustainable water management systems.
Pavement	Technical name for the road or car park surface and underlying structure, usually asphalt, concrete or blockpaving. NB The path next to the road for pedestrians (colloquially called “pavement”) is properly termed the footway.
Permeability	A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.
Permeable surface	A surface formed of material that is itself impervious to water but, by virtue of voids formed through the surface, allows infiltration of water to the sub-base through the pattern of voids, for example concrete block paving.
Pervious surface	A surface that allows inflow of rainwater into the underlying construction or soil.
Piped system	Conduits generally located below ground to conduct water to a suitable location for treatment and/or disposal.
Pollution	A change in the physical, chemical, radiological or biological quality of a resource (air, water or land) caused by man or man’s activities that is injurious to existing, intended or potential uses of the resource.
Pond	Permanently wet basin designed to retain stormwater and permit settlement of suspended solids and biological removal of pollutants.
Porous surface	A surface that infiltrates water to the sub-base across the entire surface of the material forming the surface, for example grass and gravel surfaces, porous concrete and porous asphalt.
Prevention	Site design and management to stop or reduce the occurrence of pollution and to reduce the volume of runoff by reducing impermeable areas.
Proper outfall	An outfall to a watercourse, public sewer and in some instances an adopted highway drain. Under current legislation and case law, the existence of a proper outfall is a prerequisite in defining a sewer.
Public sewer	A sewer that is vested in and maintained by a sewerage undertaker.
Rainwater harvesting or **rainwater use system**	A system that collects rainwater from where it falls rather than allowing it to drain away. It includes water that is collected within the boundaries of a property, from roofs and surrounding surfaces.
Retention pond	A pond where runoff is detained for a sufficient time to allow settlement and possibly biological treatment of some pollutants.
Runoff	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.

Section 38	An agreement entered into pursuant to Section 38 Highways Act 1980 whereby a way that has been constructed or that is to be constructed becomes a highway maintainable at the public expense. A publicly maintainable highway may include provision for drainage of the highway. (Drainage of highways is defined in section 100 (9) of the Highways Act 1980.)
Section 102 or 104	A section within the Water Industry Act 1991 permitting the adoption of a sewer, lateral drain or sewage disposal works by a sewerage undertaker. Sometimes referred to as S102 or S104.
Section 106 TCPA 1990	A section within the Town and Country Planning Act 1990 that allows a planning obligation to a local planning authority to be legally binding.
Section 106 WIA 1991	A key section of the Water Industry Act 1991, relating to the right of connection to a public sewer.
Sewer	A pipe or channel taking domestic foul and/or surface water from buildings and associated paths and hardstandings from two or more curtilages and having a proper outfall.
Sewerage undertaker	This is a collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.
Sewers for Adoption	A guide agreed between sewerage undertakers and developers (through the House Builders Federation) specifying the standards to which private sewers need to be constructed to facilitate adoption.
Soakaway	A subsurface structure into which surface water is conveyed to allow infiltration into the ground.
Source control	The control of runoff at or near its source.
SUDS	Sustainable drainage systems or sustainable (urban) drainage systems: a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques (may also be referred to as SuDS).
Surface water management train	The management of runoff in stages as it drains from a site.
Suspended solids	Undissolved particles in a liquid.
Swale	A shallow vegetated channel designed to conduct and retain water, but may also permit infiltration; the vegetation filters particulate matter.
Treatment	Improving the quality of water by physical, chemical and/or biological means.
Watercourse	A term including all rivers, streams, ditches, drains, cuts, culverts, dykes, sluices and passages through which water flows.
Wetland	A pond that has a high proportion of emergent vegetation in relation to open water.

For further updates to this glossary please refer to CIRIA's SUDS website <www.ciria.org/suds>.

Abbreviations

CDM	Construction (Design and Management) Regulations
CFMP	Catchment Flood Management Plan
Defra	Department of Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
DA	Drainage assessment
DIA	drainage impact assessment
EA	Environment Agency
FEH	*Flood estimation handbook* (IH, 1999)
FSR	*Flood studies report*
ICoP	interim code of practice
IH	Institute of Hydrology
LDD	local development documents
LDF	local development framework
NSWG	National SUDS Working Group
ODPM	Office of the Deputy Prime Minster
Ofwat	Office of Water Services
PPG	Planning Policy Guidance
PPG25	Planning Policy Guidance 25 *Development and flood risk* (DTLR, 2001)
PPG9	Planning Policy Guidance 9 *Nature conservation* (DoE, 1994)
PPS	planning policy statement
RSS	regional spatial strategy
S106 TCPA	Section 106 Agreement, Town and Country Planning Act 1990
S106 WIA	Section 106 of the Water Industry Act 1991
SPD	supplementary planning document
SPG	supplementary planning guidance
SPZ	source protection zone
SUDS	sustainable drainage system
SSSI	site of special scientific Interest
TAN5	Technical Advice Note (Wales) 5 *Planning and nature conservation* (Welsh Office, 1996a)
TAN15	Technical Advice Note (Wales) 15 *Development and flood risk* (Welsh Office, 1996b)
TCPA	Town and Country Planning Act 1990
UDP	Unitary Development Plan
WIA 91	Water Industry Act 1991
WLC	whole-life costing

1 Interim Code of Practice for SUDS

1.1 AIMS OF THE INTERIM CODE OF PRACTICE FOR SUDS

This Interim Code of Practice provides support for developers in promoting and implementing a sustainable approach to water management and in particular sustainable drainage systems (SUDS), to ensure their long-term viability and to promote consistent use. The document sets out the key regulatory requirements that must be considered and adhered to before SUDS are installed and commissioned in developments.

The approach identified will have a bearing on interactions between practitioners, regulators and other stakeholders including local authorities, highway authorities and sewerage undertakers. Early dialogue between these stakeholders in implementing SUDS is essential.

The specific objectives are to:

- encourage the implementation of SUDS in new and existing developments
- provide basic guidance for practitioners on the implementation of SUDS in new developments
- make the adoption and allocation of maintenance for SUDS more straightforward.

This document has been developed to help all involved in the development process to assess how the SUDS approach can be applied to a particular development.

1.2 FUTURE PLANS

It is expected that, like *Sewers for adoption*, this Interim Code of Practice will be reviewed from time to time and may be updated to reflect the latest developments in legislation and practices.

2 The SUDS approach

The implementation of sustainable water management through sustainable drainage systems and rainwater harvesting is becoming more common in an effort to use and manage water sustainably. The philosophy of SUDS is to mimic as closely as possible the natural drainage from a site before development and to treat runoff to remove pollutants.

SUDS provide a flexible approach to drainage, with a wide range of components from soakaways to large-scale basins or ponds. The individual techniques should be used in a management train that reinforces and, where possible, follows the natural pattern of drainage. The management train incorporates a hierarchy of techniques. These are:

1. **Prevention** – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (examples include minimising paved areas and the use of sweeping to remove surface dust from car parks),
2. **Source control** – control of runoff at or very near its source (such as the use of rainwater harvesting, pervious pavements, green roofs or soakaways for individual houses).
3. **Site control** – management of water from several sub-catchments (including routeing water from roofs and car parks to one large soakaway or infiltration basin for the whole site).
4. **Regional control** – management of runoff from several sites, typically in a detention pond or wetland.

Adopting a holistic approach towards surface water drainage provides the benefits of combined water quality and quantity control, as well as increased amenity value. This is accomplished by managing the increased flows and pollution from surface water runoff that can arise from development. Ideally, the system should utilise a management train and should achieve equal standing in all three of these areas. However, specific site considerations may mean that a balance of benefits is not always achieved.

2.1 BENEFITS OF SUDS

It is generally accepted that the implementation of the SUDS approach, as opposed to conventional drainage systems, provides several benefits. Appropriately designed, constructed and maintained SUDS may improve the sustainable management of water for a site by:

- reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream
- reducing volumes and the frequency of water flowing directly to watercourses or sewers from developed sites
- improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources

- reducing potable water demand through rainwater harvesting
- improving amenity through the provision of public open space and wildlife habitat
- replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

The need for sustainable drainage is not disputed, but problems may arise if SUDS are not properly designed and maintained. Maintenance requirements for SUDS differ from those for conventional systems, but this should not be a barrier to their selection. Advantages in flood control, pollution control, water reuse and groundwater recharge may have benefits, both locally and more widely in the environment, which may offset changes in management practices.

A considerable amount of research on sustainable drainage is in hand in the UK, and knowledge of the design of SUDS and their longer-term effectiveness is continually improving. Consequently, designers, planning authorities and regulators should be aware of developments in SUDS design and should refer to CIRIA's SUDS website and other sources for the latest information.

2.2 IMPLEMENTATION OF SUDS

Before SUDS can be implemented in a development, certain elements of the scheme should be considered, and these are listed below.

1. **Early discussion with stakeholders.** SUDS can make an important contribution to the overall sustainability of a development. However, a successful SUDS scheme will require the design team to liase and integrate with other stakeholders involved in the development process. The design team and stakeholders should consider SUDS at the feasibility stage of development so as to realise the optimum contribution from a sustainable approach.
2. **Ground and groundwater considerations.** Ground and groundwater conditions may limit the types of techniques that can be used. Groundwater protection zones are particularly important and the potential risk from infiltration techniques to groundwater should be carefully managed (Section 4.1.2).
3. **Drainage impact assessment.** It is increasingly common (particularly in Scotland) for local planning authorities to request a drainage impact assessment to help ensure that the impacts of a proposed development on the catchment are understood and managed (Section 3.8.2).
4. **Interaction with foul water sewers.** Where there are no separate foul and surface water sewers on a development, Section 106 of the Water Industry Act 1991 effectively permits the discharge of surface water from SUDS to foul and combined sewers. This is unacceptable, as unplanned surface water drainage connections may exacerbate the risk of flooding where sewers had been designed to accept only foul flows (or where combined sewers are running at capacity).

   Surface water drainage systems should be dealt with sustainably through SUDS techniques or connected correctly to surface water sewers to avoid the risk of sewage-related flooding. Once agreed for a

particular development the drainage arrangements should not be altered in the future.

5. **Long-term maintenance requirements.** Maintenance of SUDS differs from that for conventional systems, so it is important to allocate responsibility for the maintenance of SUDS early in discussion before planning approval for the development is given. The model agreements developed to accompany the Interim Code of Practice should assist with this process.

2.3 SUDS DRAINAGE COMPONENTS

Ideally, a holistic approach should be used in designing SUDS so that they are operated collectively rather than as a series of isolated drainage devices. Within the philosophy of the surface water management train each component adds to the performance of the whole drainage system.

The full range of SUDS components are discussed in detail within CIRIA publication C609 *SUDS techniques – hydraulic, structural and water quality advice*. Table 2.1 includes summarised information of the most popular SUDS components and should not be regarded as comprehensive.

Table 2.1 *Summary of SUDS components*

Preventative measures	The first stage of the SUDS approach to prevent or reduce pollution and runoff quantities. This may include good housekeeping, to prevent spills and leaks, storage in water butts, rainwater harvesting systems, and alternative roofs (ie green and brown roofs).
Pervious surfaces	Surfaces that allow inflow of rainwater into the underlying construction or soil.
Green roofs	Vegetated roofs that reduce the volume and rate of runoff and remove pollution.
Filter drains	Linear drains consisting of trenches filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water; they may also permit infiltration.
Filter strips	Vegetated areas of gently sloping ground designed to drain water evenly off impermeable areas and to filter out silt and other particulates.
Swales	Shallow vegetated channels that conduct and retain water, and may also permit infiltration; the vegetation filters particulate matter.
Basins, ponds and wetland	Areas that may be utilised for surface runoff storage.
Infiltration devices	Sub-surface structures to promote the infiltration of surface water to ground. They can be trenches, basins or soakaways.
Bioretention areas	Vegetated areas designed to collect and treat water before discharge via a piped system or infiltration to the ground.
Filters	Engineered sand filters designed to remove pollutants from runoff.
Pipes and accessories	A series of conduits and their accessories normally laid underground that convey surface water to a suitable location for treatment and/or disposal. (Although sustainable, these techniques should be considered where other SUDS techniques are not practicable).

3 Planning

3.1 THE ROLE OF PLANNING AND PLANNING AGREEMENTS

Local planning authorities play a pivotal role in ensuring that sustainable drainage systems are incorporated into new developments. It is essential that all relevant organisations meet at an early stage to agree the principles of the most appropriate drainage system or combination of systems (see Section 6.2). These organisations may include some or all of the following:

- local authority
- developer/owner
- highway authority
- sewerage undertaker
- Environment Agency.

There are currently no legally binding obligations relating to the provision and maintenance of SUDS as opposed to conventional foul and surface water drainage systems. Until this position changes, the most appropriate method of achieving implementation and long-term maintenance of SUDS is an agreement under Section 106 of the Town and Country Planning Act.

Before granting planning permission, the local planning authority should secure such an agreement with the developer, as this can often facilitate the allocation of responsibilities for maintenance. In particular, the Section 106 agreement will require a SUDS maintenance framework agreement to be entered into between the relevant parties (as determined by the extent of proposed SUDS).

A Town and Country Planning Act Section 106 model agreement (ICoP SUDS MA1), a maintenance framework agreement (ICoP SUDS MA2) and a model discharge agreement (ICoP SUDS MA3) have been developed for use in conjunction with this Interim Code of Practice and can be found at CIRIA's SUDS website <www.ciria.org/suds/icop.htm>. These have been audited for legal, financial and insurance implications. However, additional negotiations and legal preparatory work will be needed on a case-by-case basis when using the agreements.

The guidance provided by this Interim Code of Practice will support and promote the use of SUDS but early discussion and agreement between the relevant stakeholders on the SUDS scheme most suitable for a particular site is essential.

3.2 PLANNING FRAMEWORK

The Government's Planning Green Paper (December 2001) announced that regional planning guidance will be replaced by statutory regional spatial strategies (RSS) that will form part of the development plan. Under the proposals, structure plans will be abolished and local plans and unitary development plans (UDP) replaced by local development frameworks (LDFs). The Planning and Compulsory Purchase Bill, which is currently before Parliament, does not refer directly to LDFs, but refers to the local development documents (LDDs) that form part of the LDF. Table 3.1 and Figure 3.1 demonstrate how the proposed system will work.

Some of the documents forming the local development documents will have development plan status, subject to independent examination, and others will have the status of what is currently known as supplementary planning guidance (SPG). The proposals in the Planning and Compulsory Purchase Bill will require local authorities to draw up a local development scheme, setting out the LDDs that they intend to produce. The local development scheme will be a key document, setting out what the local planning authority and local development documents wish to achieve through its LDF.

The transition to the regional spatial strategies will not be immediate although the ODPM wishes local planning authorities to use the new framework by summer 2004.

Table 3.1 provides details of current planning documents and the replacements proposed in the Planning and Compulsory Purchase Bill. Figure 3.1 also provides some details of how the new framework will work.

Table 3.1 *Planning documents*

Current documents	**Proposed documents (Planning and Compulsory Purchase Bill)**
Planning policy guidance	Planning policy statements
Regional planning guidance	Regional spatial Strategy
Unitary development Plan	Development plan documents • Core strategy • Proposals map • Area action plans • Site-specific policies
Structure plan	
Local plan	
Supplementary planning guidance	Supplementary planning document Statement of community involvement

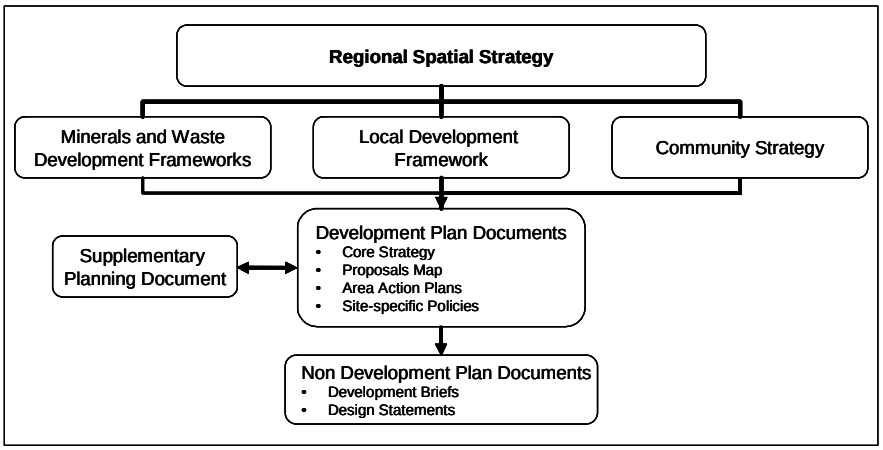

Figure 3.1 *Local development framework*

3.3 INCLUSION OF SUDS IN PLANNING POLICY

Following the implementation of the Planning and Compulsory Purchase Bill (Section 3.2), the planning system will continue to be a plan-led system. This means that planning decisions should agree with the information set out in development plans (unless other material considerations indicate otherwise). The need to consider the SUDS approach to drainage should be included in development plans, and the development control process can then be used as a lever to ensure that SUDS are implemented where practicable.

Appropriate policies to encourage the sustainable management of water should be included in the regional spatial strategy and local development frameworks. More detailed guidance can be provided in development briefs, which should consider the appropriate allocations of land uses within a site, and possibly between sites.

To assist this process, local planning authorities can prepare supplementary planning documents that set out the main features of SUDS and provide guidance on how the planning authority would expect these features to be incorporated into development schemes.

3.4 PLANNING GUIDANCE

Under the Town and Country Planning General Development Procedure (1995), the Environment Agency is a statutory consultee in the planning process and advises local planning authorities on general drainage and flooding issues. It may request that improvements be made to local watercourses to ensure an adequate outfall for surface water drainage.

Planning policies need to take account of planning guidance. In England the most relevant planning guidance with respect to SUDS is Planning Policy Guidance 25 (PPG25) *Development and flood risk* (DTLR, 2001) and in Wales it is a combination of *Planning Policy Wales* and Technical Advice Note (Wales) 15 *Development and flood risk* (TAN15). Information from Environment Agency floodplain maps and other documents on flood risk areas should also be consulted. In suitable locations, with appropriate

design standards and adequate provision for long-term maintenance, SUDS can provide positive improvements to surface water drainage systems. Additionally, PPG9 *Nature conservation* (and TAN5 *Planning and nature conservation)* is relevant to the amenity and wildlife aspects of SUDS.

3.4.1 Development and flood risk

PPG25 and TAN15 identify how built development can affect flooding by increasing, or in some cases decreasing, runoff. Development usually increases the area of impermeable surface that promotes rapid runoff to surface water rather than percolation into the ground. The effect can be to increase both total and peak water flows, contributing to flooding. However, by introducing vegetated areas in place of impermeable surfaces, redevelopment of brownfield sites may in some cases reduce runoff.

PPG25 advises that the provision of SUDS can restrict and reduce surface water runoff. The guidance recognises that SUDS can also contribute to good design by improving the amenity and wildlife interest of developments, as well as by encouraging natural groundwater recharge.

Local planning authorities are encouraged to work closely with the Environment Agency, sewerage undertakers, navigation authorities, highway authorities and prospective developers and landowners to introduce SUDS, to enable surface water runoff to be controlled as near to the source as possible.

PPG25 advises that, properly planned, SUDS can lead to opportunities for more imaginative and attractive developments. In some circumstances, the use of SUDS can also allow a development to proceed that would otherwise be refused because of the increased flood risk caused by runoff.

However, PPG25 indicates that there are also constraints on the use of SUDS that may require innovative engineering solutions. In particular:

- SUDS may require more space than conventional drainage systems;
- the opportunities for infiltration devices may be limited where:
    - the soil is not very permeable
    - the water table is shallow
    - the groundwater under the site may be put at risk
    - land contamination may be present
    - infiltration of water into the ground may adversely affect ground stability (PPG14 *Development on unstable land*).

In this context, PPG25 advises that selection and design of infiltration systems needs to take account of *Policy and practice for the protection of groundwater* (Environment Agency, 1998a), together with groundwater protection zone maps and groundwater vulnerability maps. The appraisal procedure recommended for non-mains sewerage in Circular 3/99 (DETR, 1999) could usefully be applied in planning for infiltration devices.

PPG25 advises that contingency measures should be considered to ensure that flooding risks are not made worse when the quantity of runoff exceeds the capacity for which a drainage system was designed, ie the need to design for exceedance.

On implementing SUDS, PPG25 emphasises the need to consider SUDS at both the conception and detailed stages of development schemes. In particular, PPG25 highlights the following issues:

- integration of SUDS into the overall site concept and layout
- the need for investigation and subsequent remediation of contaminated land
- agreements on adoption, maintenance and operation of the systems
- the need to monitor long-term performance.

PPG25 advises that the planning system can further the use of SUDS by:

- incorporating favourable strategic policies within regional planning guidance and structure plans (regional spatial strategies)
- adopting detailed policies for promoting SUDS in local plans (development frameworks)
- persuading developers to install SUDS wherever practicable, as part of all future development, and if necessary through the use of appropriate planning conditions or by planning agreements
- developing joint strategies with the sewerage undertakers and the Environment Agency to further encourage the use of SUDS.

3.4.2 Development and nature conservation

Local planning authorities have a responsibility to help achieve targets set in national and local biodiversity action plans. Guidance on this and on the integration of nature conservation priorities and land use planning is provided in PPG9 *Nature conservation* and, for Wales, in TAN5 *Planning and nature conservation*. SUDS can be useful in contributing to these aims.

3.5 REGIONAL PLANNING CONTEXT

In England, regional planning guidance (RPG), (proposed to be replaced by regional spatial strategies in the Planning and Compulsory Purchase Bill), takes account of government policies on planning, as set out in Planning Policy Guidance Notes, and sets out a broad development strategy for a region for at least 15 years ahead. Local authority development plans (structure plans, local plans, and minerals and waste plans) should be prepared. The Planning and Compulsory Purchase Bill proposes that LDFs replace structure plans, local plans, and minerals and waste plans.

Within RPG and RSS, government advice on development and flood risk (PPG25), including SUDS, will generally be given regional expression at a fairly general level.

Planning Policy Wales (Welsh Assembly Government, 2002) sets out the land use policies of the Welsh Assembly Government and promotes the use of SUDS where appropriate. Within Wales, Technical Advice Notes (TANs) provide additional information on implementing planning policy. Welsh Office circulars provide procedural guidance on national planning policy.

3.6 LOCAL PLANNING CONTEXT

Existing structure plans, local plans and proposed local development frameworks (LDF) should set a more detailed approach to the provision of SUDS. While the LDF will not generally identify particular proposals or specific sites, it should provide a robust framework for promoting SUDS through supplementary planning documents and for their implementation through development briefs and the development control process.

The explanatory text of the local development framework should set out the justification for SUDS. This should be based on the advice in PPG25 or TAN15 and relevant additional material included in this document. The explanatory text should also briefly describe the possible components of SUDS and identify the likely benefits and constraints in the local area.

Reference should be made in the explanatory text to relevant source documents, such as:

- Interim Code of Practice for SUDS
- PPG25 *Development and flood risk* (DTLR, 2001), TAN15 (Welsh Office, 1996b) and Planning Policy Wales (Welsh Assembly Government, 2002)
- PPG9 *Nature conservation* (DoE, 1994b) and TAN5 *Planning and nature conservation* (Welsh Office, 1996b)
- *Policy and practice for the protection of groundwater* (EA, 1998a)
- Environment Agency maps indicating groundwater source protection zones (SPZs)
- Environment Agency groundwater vulnerability maps
- *Sustainable drainage systems: an introduction*, published by the Environment Agency, the Scottish Environment Protection Agency and the Environment & Heritage Service, Northern Ireland (EA *et al*, 2001a)
- Circular 3/99 *Planning requirements in respect of the use of non-mains sewerage incorporating septic tanks in new development* (DETR, 1999)
- PPG23 *Planning and pollution control* (DoE, 1994a)
- Building Regulations Part H.

The Environment Agency has suggested that policies should be included in local plans (local development frameworks) that:

- ensure that developers incorporate SUDS in their proposals to prevent the water environment being adversely affected by:
    - increasing surface water runoff
    - increasing the risk of pollution, in particular diffuse pollution
    - reducing the recharge of groundwater
    - increasing the risk to property from rising groundwater
    - causing physical damage to the beds and banks of watercourses
- ensure that any SUDS implemented have adequate provision for their future maintenance.

Below are examples of issues that might be considered for inclusion as part of a local plan policy relating to SUDS. These examples can be found in the South Gloucestershire Local Plan.

Development that would have an unacceptable effect on the water environment, including surface water and groundwater quality and quantity, river corridors and associated wetlands, will not be permitted.

Development proposals will be required to incorporate sustainable drainage systems (SUDS) for the disposal of surface waters. Where this is not practicable it must be demonstrated that an alternative means of surface water disposal is incorporated.

Several local planning authorities have supported policy statements by providing supplementary planning guidance on SUDS (eg South Gloucestershire, Chichester and Poole). SPGs set out in more detail how the policy will be interpreted and how it can be complied with. Although they do not form part of the local or unitary development plan, they are important factors for the local planning authority to take into account when assessing planning applications and the suitability of surface water drainage provisions for a site. SPGs relating to SUDS normally include information on:

- the potential problems caused by surface water runoff
- the aims of the SUDS approach to drainage
- the benefits of SUDS
- the planning policy context
- sustainable drainage techniques
- SUDS and the planning process
- adoption and maintenance
- choosing the right combination of SUDS techniques
- local soil permeability and hydrology characteristics
- other relevant source documents.

Together, the local and unitary development plans (local development framework) and supplementary planning guidance (supplementary planning documents) provide the local policy context for SUDS.

3.7 DEALING WITH DEVELOPMENT

3.7.1 Development briefs

At the more detailed level, the provision of SUDS can be planned through development briefs and master plans. Development briefs should identify the topography, soil permeability, geological and hydrological characteristics of the site and identify sustainable drainage mechanisms suitable for those characteristics. Development briefs should also consider existing biodiversity interests, groundwater vulnerability, mitigation and compensation measures.

An assessment should be made of runoff characteristics and site constraints and appropriate SUDS mechanisms should be designed to cater for them.

In cases where the local planning authority does not have detailed data on soil characteristics and the hydrology and hydrogeology of specific sites, developers may have to provide this additional information.

Within the development brief, SUDS components should be integrated within the overall layout of the site. There may be opportunities to consider SUDS over a wide area and across a number of sites rather than just on an individual development site. For instance, the topographical features of an area may be a more appropriate consideration in the location of an attenuation pond than a site boundary.

The development of appropriate SUDS is likely to be an iterative process. For instance, changes to the density and layout of development to accommodate SUDS components may affect the runoff characteristics of the development and hence the capacity and scale of the SUDS required. Developers should engage with the planning process and liase with the relevant stakeholders at the earliest opportunity to ensure the most appropriate sustainable drainage scheme.

At this stage, consideration should also be given to the maintenance regime and, more importantly, the allocation of responsibility for the long-term maintenance and operation of SUDS implemented within the site.

It is important that developers, sewerage undertakers, highway authorities, local planning authorities and the Environment Agency work together and engage the appropriate technical skills to design and evaluate the effectiveness of any proposed SUDS. In designing and evaluating any drainage system, consideration must be given to alternative flood routeing in the event of rainfall that exceeds the design standard of the proposed systems (as outlined in *Sewers for adoption*).

3.7.2 Development control

PPG25, Planning Policy Wales and TAN15 encourage local planning authorities to adopt sustainable drainage wherever practicable, if necessary through the use of appropriate planning conditions or by planning agreements, eg Section 106 of the TCPA.

Planning conditions can be appealed against and enforcement can be difficult. However, Section 106 of the TCPA provides greater security for the implementation of SUDS.

SUDS are often integral to a development, so, to ensure suitable consideration of SUDS design, local authority planners and developers should liase at an early stage of proposals to discuss options for a sustainable approach to site drainage.

In the first instance, developers should be encouraged to include proposals for SUDS in the details submitted in support of a planning application. This can be assisted by appropriate policies in local plans (local development frameworks), supplementary planning guidance (supplementary planning documents) and development briefs (see above). Should a suitable scheme be submitted with the application, its implementation can be secured through a simple condition along the lines indicated in the box below.

The drainage scheme approved, incorporating sustainable drainage principles, shall be implemented in accordance with the approved details before the development is completed/occupied.

In the absence of the submission of a suitable sustainable drainage scheme with the planning application, then a condition along the lines set out below may be more appropriate:

Development shall not begin until drainage details, incorporating sustainable drainage principles and an assessment of the hydrological and hydrogeological context of the development, have been submitted to and approved by the local planning authority, and the scheme shall subsequently be implemented in accordance with the approved details before the development is completed/occupied.

In either case, the local planning authority will need to consult with the Environment Agency, the sewerage undertaker and obtain appropriate technical advice on the suitability and effectiveness of the design of the proposed SUDS to cater for the expected runoff characteristics of the development.

3.8 GUIDANCE AND REGULATIONS FOR SITE DRAINAGE

3.8.1 Building Regulations, Part H

In addition to planning guidance, Part H of the Building Regulations was amended in 2002 to encourage and provide guidance on the incorporation of SUDS in drainage systems. This provides a hierarchical approach for the disposal of rainwater, with the preferred option being to drain it to an adequate soakaway or other infiltration system. If this is not possible, the next favoured option is to discharge to a watercourse. Only if neither of these options is possible should the site discharge rainwater to a sewer.

The Building Regulations Part H also includes reference to, and brief information on, some SUDS components such as pervious pavements, swales, filter drains and detention ponds.

3.8.2 Drainage impact assessments

Within Scotland, local authorities are beginning to introduce a requirement for the production of a drainage impact assessment (DIA) or drainage assessment (DA) for developments. The DIA will ensure that consideration is given to the impact of the proposed development on the catchment. It should be submitted with the first planning application for developments that require waste or surface water to be drained.

The DIA is site-specific, and guidance on the completion of the assessment recommends the implementation of a drainage system that provides the best environmental protection and states that SUDS is the preferred method of surface water drainage.

Guidance produced by the North East Scotland Flooding Advisory Group suggests that in some cases – particularly for larger developments or developments within a sensitive catchment – a pre-application meeting can help facilitate the process of the application.

Greater detail on the completion of a DIA is provided by North East Scotland Flooding Advisory Group. The basic requirements for a drainage impact assessment include:

- an examination of drainage patterns including overland flood pathways during extreme events
- concept drawing of the development proposal
- brief summary of how the drainage design provides SUDS techniques (in accordance with CIRIA guidance)
- summary of SUDS to be incorporated
- soil classification for the site
- evidence of soil porosity sites (where possible at site of infiltration devices)
- consideration of ground and groundwater conditions
- calculation for runoff flow for the range of critical rainfall events
- attenuation and treatment designed for a relevant return period rainfall events
- wastewater drainage proposals
- confirmation of maintenance responsibility
- copy of letter from sewerage undertaker giving location of nearest public sewer and confirmation of their availability for servicing the site.

3.8.3 Highways

Although not a statutory document, many highways authorities refer to the *Design Manual for Roads and Bridges* (DMRB – published by the Highways Agency and others) when assessing drainage schemes for roads on new developments. The DMRB provides advice on the design of highway drainage systems, which includes guidance on the design of some of the components used in SUDS design. The guidance can be found in HA103/01 *Vegetative treatment systems for highway runoff* (HA *et al*, 2001).

3.9 TCPA SECTION 106 AGREEMENTS TO SECURE MAINTENANCE

Before granting planning permission, the local planning authority may need to secure a Section 106 agreement to clarify and establish appropriate mechanisms for adoption and maintenance of the SUDS. In some instances it will be necessary to ensure that a properly guaranteed or bonded maintenance arrangement is put in place or to secure a commuted sum to fund maintenance by another agency (such as the local authority). The model agreements developed with this Interim Code of Practice can help facilitate this process.

The powers of various agencies to adopt and maintain SUDS are summarised in Section 5 of this document. Because planning permission

cannot be granted subject to obtaining an agreement, it is recommended that the local planning authority obtain the agreement of the adopting agency before the SUDS are approved through the development control process. This may require a restrictive condition such as that in Section 3.7.2 to prevent the development beginning before the drainage arrangements are in place.

3.9.1 Maintenance arrangements

The design of SUDS should facilitate safe and convenient access by personnel and construction plant to undertake maintenance tasks.

To avoid compromising the effectiveness of the SUDS, it is important to give priority to the proposed maintenance regime over other considerations. The creation or enhancement of any wildlife habitat as a result of the SUDS must recognise potential impacts on the maintenance requirements. In most cases, however, the most effective and economic maintenance of SUDS is compatible with the presence of wildlife.

CIRIA publication C609 *Sustainable drainage systems – hydraulic, structural and water quality advice* (Wilson *et al*, 2004) provides information on designing SUDS systems to facilitate effective maintenance and on managing the interaction between function, amenity and maintenance.

4 Legal issues

4.1 WATER QUALITY

It is essential that all drainage systems, including SUDS, comply with environmental legislation. The Environment Agency regulates pollution of controlled waters through the issue of permits or discharge consents. Any discharge of pollutants into controlled waters must be authorised in advance by the Agency, otherwise it would be a criminal offence. The Agency also has notice powers relating to activities with potential to cause pollution.

Although they can bring significant environmental benefits, SUDS are not exempt from environmental regulation. They must comply with all relevant UK statutes and regulations, and all drainage (including SUDS) designs should adhere to relevant codes of practice and available pollution prevention guidance.

4.1.1 Water Framework Directive

The Water Framework Directive (2000/60/EC), which has been transposed into UK national legislation, requires controls to be applied to discharges to the water environment from sources that include all discharges of surface water. It extends the controls under existing European Community legislation. Additionally, the Water Framework Directive (WFD) prohibits all direct discharges of pollutants to groundwater from drainage systems. Again, this goes beyond existing requirements, in particular those relating to direct discharges in the Groundwater Directive 80/68/EEC.

New European “daughter” directives are being developed under the WFD’s Article 16 in relation to “Priority Substances”’, and under Article 17 in relation to groundwater. The European Commission has published a proposal for a Groundwater Daughter Directive, which is expected to clarify Article 4 of the WFD , which requires member states to “prevent or limit” the entry of pollutants into groundwater. In due course, this daughter directive will replace the provisions of the existing Dangerous Substances Directive (as it applies to groundwater) and the Groundwater Directive. UK legislation may need to be amended to take account of the new European measures.

This legislation is likely to mean that a wider range of substances will need to be included in any hazard assessment for drainage discharges and that some direct discharges will be prohibited. It may permit the use of codes of practice.

4.1.2 Discharges to groundwater

Regulation

The principal items of legislation relating to the prevention and control of groundwater pollution in England and Wales are the Water Resources Act

1991 and the Groundwater Regulations 1998. The Regulations transpose the EC Groundwater Directive 80/68/EEC.

Under Section 85 of the Water Resources Act 1991, it is an offence to cause or knowingly permit any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters. It is a defence if the activity was performed under one of the forms of authorisation listed in Section 88 of that Act.

The purpose of the Regulations is to protect groundwater from pollution by certain listed substances. These substances are defined in Lists I and II of the Directive and Regulations.

List I substances are those which are so harmful that they must be prevented from entering groundwater. List II substances are still potentially harmful. They must be regulated to prevent pollution of groundwater. These substances are regulated by the granting of authorisations by the Environment Agency, and such authorisation act as a defence against the Section 85 offence.

Groundwater authorisations

By virtue of the Regulations, it is an offence to allow List I substances to enter groundwater. The Environment Agency may not authorise direct or indirect discharges that would have this effect except in a very few specific circumstances. It is also an offence to allow a List II substance to enter groundwater without prior investigation and authorisation by the Agency. Discharges of List II substances are allowed only if precautions are taken to prevent groundwater pollution, and authorisations can include conditions to this effect. Any disposal or tipping to land of listed substances similarly require prior investigation and authorisation by the Agency.

Various activities utilise or involve listed substances without normally making deliberate discharges to the environment. Provided that no discharges occur, such activities do not require an authorisation under the Groundwater Regulations. Nevertheless, these activities could result in a non-deliberate or accidental discharge. Regulation 19 provides the Environment Agency with powers to serve notices (Groundwater Regulation Notices) to control any activity that might lead to an indirect discharge of any substance in List I or the pollution of groundwater as a result of an indirect discharge of any substance in List II. These notices can either prohibit the activity or grant an authorisation imposing conditions under which the activity can be carried out. Failure to comply with such a notice is also an offence under Section 85 of the Water Resources Act 1991.

Although there is potential for listed substances to be present in surface water draining to land, not all SUDS discharges using infiltration systems require an authorisation. Where the Environment Agency considers that the likely concentration or total quantity of listed substances in the discharge is so small that it would not risk entry of a List I substance into, or pollution by, a List II substance of the receiving groundwater, an authorisation would not be required. Further information on this is included in the statutory guidance on the Groundwater Regulations (DETR, 2001) and the *Groundwater Regulations process handbook* (EA, 2000). The Environment Agency must

make a case-by-case assessment as to whether an existing or proposed discharge is exempt, though certain classes of discharge, such as roof drainage, are extremely unlikely to need authorisations. Table 4.1 provides an indication of the circumstances where SUDS discharges are not likely to require an authorisation.

Table 4.1 *Source hazard assessment for SUDS to determine whether the requirement for an authorisation for the discharge may be relaxed*

Source (catchment)	Requirement for authorisation [1, 2]
Roof drainage	Not normally required – provided it is via a sealed system[3]
Residential area, amenity area	Not normally required – provided discharge is not direct to soakaway and in accordance with good practice
Car park	Not normally required – if properly constructed (ie in accordance with the principles described in CIRIA C522, C582, C609, this document and good practice)
Lorry park, garage forecourt – outside canopy	Required
Local roads [4]	Not normally required – but if necessary to prevent listed substances entering or polluting groundwater or polluting surface waters the Environment Agency will serve notice to control the discharge
Major road [4]	Not normally required – but if necessary to prevent listed substances entering or polluting groundwater the Environment Agency will serve notice to control the discharge
Industrial site, major commercial site	Required

Notes

1. For general guidance only and should be read in conjunction with *Policy and practice for the protection of groundwater* (EA, 1998a). Individual circumstances may vary depending on specific activities in the catchment of the SUDS.
2. It is assumed that no treatment is included (such as oil separators, wetlands or reed beds).
3. Sealed system for roof drainage means downpipes are cemented in or otherwise connected directly to the surface water drainage system and do not discharge via an open grating to the drain.
4. The Environment Agency has a duty to control the discharge of road drainage by serving a notice under Section 86 of the WRA 1991 if it is necessary to do so for the purpose of: (i) preventing the introduction of List I substances into groundwater or, (ii) pollution of groundwater by List II substances or (iii) pollution of a surface water. (Groundwater Regulations 1998 Regulation 4(4) and 5(3) and WRA 1991 S86(1).) The Environment Agency will generally only serve such a notice where it considers that the pollution risk is too great.

In such circumstances, the Environment Agency may use its notice powers to control activities associated with surface water drainage where it is necessary to ensure compliance with the Groundwater Regulations.

The Groundwater Regulations place a duty on the Environment Agency to use powers under Section 86 of the Water Resources Act 1991 if it is necessary to prevent a highway drain from discharging List I substances into groundwater or polluting groundwater by List II substances.

To assess what is needed for a specific surface water discharge to comply with the groundwater protection legislation, it is important to understand the likely impact of the source of the surface water on the groundwater when it is discharged. Table 4.1 should be used to facilitate this process and to determine whether an authorisation for discharge may be relaxed.

If the discharge is from a highway drain, it may be necessary for Environment Agency to serve a Section 86 notice (under the Water Resources Act) to ensure compliance with the Groundwater Regulations.

If there is uncertainty as to the source of the discharge or the potential sensitivity of the groundwater, or where required by the Regulations, it will be necessary to undertake a prior investigation to determine whether the discharge can be authorised.

In all cases, the discharge is assumed to, and should, follow good practice as set out in any relevant statutory or generally accepted codes of practice. To comply with codes of good practice, certain minimum set-off distances from features such as wells, boreholes and springs used for potable supply must be observed.

Statutory codes of practices are being developed under the Regulations for activities with the potential to cause groundwater pollution. It is proposed that the requirements of such a code for surface water drainage systems will be incorporated in a future revision of this code of practice, following appropriate public consultation and with ministerial approval.

Discharge consents for direct discharges to groundwater

Under the Water Resources Act direct discharges to groundwater are prohibited except where covered by a prior discharge consent from the Environment Agency. Such consents are treated as authorisations under the Groundwater Regulations.

4.1.3 Discharges to surface waters

Regulation

The statutory framework for regulating discharges to surface waters is detailed in Chapter II of Part III, Sections 85 to 89 Water Resources Act 1991, which make it an offence to discharge polluting matter to controlled waters without a discharge consent from the Environment Agency.

Discharge consents

A discharge consent may specify conditions, which can include limits on quantity and quality that must be met. For a surface water discharge, the level of regulation applied by the Environment Agency will be proportionate to the risk of contamination of that discharge. Table 4.1 outlines the likely discharge consent requirements for a range of SUDS and are summarised below.

1. If the surface water discharge is uncontaminated surface water, a discharge consent will not be required.
2. Where the discharge has a high risk of contamination and/or the runoff requires treatment before it can be discharged to a controlled water, it will require a discharge consent.

For any surface water discharges that lie between these situations the Environment Agency will require the developer to conduct a risk assessment of the drainage system to identify the potential sources of pollution, pathways and consequences of a possible pollution incident on the receiving water and include contingencies to deal with such scenarios. The Environment Agency should be consulted at an early stage on this assessment so that the nature and scope can be discussed along with any pre-application requirements. Once the risk assessment has been completed a decision on the discharge consent requirements can be made.

Some receiving waters are more sensitive than others to pollution and, in the absence of more robust assessment, a degree of flexibility and pragmatism is required.

Developers should be aware that the statutory timeframe for the determination of an application for a discharge consent is four months (some complex determinations may take longer) and includes statutory and public consultations. A discharge consent can only be granted to a named holder, which must be a legal person (eg an individual or company or other corporate body). The consent-holder accepts responsibility for holding (and complying with) the discharge consent. Thus the operator or controller of the SUDS would normally hold the discharge consent. For SUDS, the discharge consent will normally be framed in descriptive terms to protect the receiving water, focusing on the periodic need for maintenance in relation to causes of a potential deterioration of performance such as vegetation removal, de-silting etc. Enforcement, if necessary, is likely to be via an enforcement notice specifying the action to be taken to ensure the discharge consent meets its conditions (eg restoring the SUDS to their intended function).

4.2 HIGHWAY AUTHORITIES' RIGHT TO DISCHARGE

Highway authorities have powers and duties to construct, adopt and manage drainage infrastructure. These powers include rights to drain through, and to, land owned by other parties and to watercourses where the highway authority is not the riparian owner; this in some circumstances includes the right to drain to public sewers. Sewerage undertakers also have the right to discharge surface water from their public sewers into highway drains.

Clearly the primary focus of the highway authority is the effective drainage of the highway, but in exceptional cases it is also able to permit drainage from properties into highway drains and to regulate this through agreements where the quality of discharge will be managed. However, it is not possible for highway authorities to demand ongoing charges from people who benefit from such arrangements. However, there is nothing to prevent highway authorities from accepting commuted sums from developers in order to take responsibility for SUDS.

Many local authorities are now unitary authorities, with full planning powers, land drainage powers and highway authority powers, and so clearly have the potential to be important stakeholders in the promotion and implementation of SUDS. For councils operating in a two-tier environment there are still opportunities to bring their respective responsibilities together (through agency or other joint arrangements) to secure the same approach. The

ability of councils to engage positively as owners/managers of SUDS drainage infrastructure other than in restricted circumstance for highway-only drainage is constrained by the funding issue.

Highway drainage consents

Highway authorities do not require discharge consents for highway runoff either to surface waters or to ground. The main pieces of legislation of relevance are Section 100 of the Highways Act 1980, Section 89 of the Water Resources Act 1991 and Regulations 1, 4(4)(a) and 5(3)(a) of the Groundwater Regulations 1998. In the event of evidence that a highway discharge is causing pollution, the Environment Agency has the power (and in respect of discharges to ground, a duty) to control that discharge by serving notice under Section 86 of the Water Resources Act 1991.

The consequence of the above is that highway authorities have a responsibility to ensure that discharges are not causing pollution and that it is for them to determine how pollution control is carried out. Highway authorities consult with the Environment Agency to seek to reach agreement on any treatment measures to be provided, but formal approval may not be needed.

A consent may be required for the construction of an outfall within a watercourse from the Environment Agency, the internal drainage board, or other body responsible for the watercourse. This is required by Section 339 of the Highways Act 1980 for drainage constructed under Highways Act powers. There is overlapping legislation for main rivers in Section 109 of the Water Resources Act 1991. Section 23 of the Land Drainage Act 1991 does not apply where highway authorities are constructing a scheme under Highways Orders or otherwise using their drainage powers under the Highways Act.

A consent for construction details is required, and may not be unreasonably withheld. It is considered that such a consent may prohibit the use of some forms of drainage that do not attenuate flows. Such consents may also include restrictions on flow rates of the discharge subject to the consent, but may not require the use of particular types of drainage system.

4.3 WASTE MANAGEMENT

Sedimentation is likely to occur in SUDS, many systems are designed to promote sedimentation as a treatment function and the silt must be managed. Consequently, there will be a requirement to remove deposited sediment periodically to ensure that the system continues to operate efficiently and effectively (ie as designed) and to control the risk of environmental pollution. However, depending upon the characteristics of the SUDS catchment these sediments could be contaminated to varying degrees. This presents a potential risk to the land upon which the sediments are deposited and any receiving surface or groundwater.

Where sediment waste arisings from SUDS maintenance are removed off-site, they must be treated as controlled waste and are subject to control under the Waste Management Licensing Regime. The Special Waste

Regulations (1996) may also be relevant. All maintenance of SUDS and resulting disposals must be undertaken within the relevant statutory frameworks (particularly the Waste Management Regime) and advice can be sought from the Environment Agency.

CIRIA publication C609 *Sustainable drainage systems – hydraulic, structural and water quality advice* provides detailed information on maintenance and the disposal of sediments.

5 Adoption and maintenance

This section explains how legislation can facilitate the implementation of SUDS even though it was not produced with SUDS in mind.

Model agreements have been developed in conjunction with this Interim Code of Practice. They facilitate the use of planning legislation to secure the long-term responsibility for sustainable drainage (Section 7).

5.1 LOCAL AUTHORITIES' POWERS TO ADOPT AND MAINTAIN SUDS

Provision of open space within development sites is a normal planning requirement. Such landscaped areas are suitable for the inclusion of a wide range of SUDS components (eg ponds, basins and swales). These components can enhance the aesthetics, nature conservation and amenity value of the site, although the primary consideration should be the effectiveness and maintenance of the SUDS.

Where a local authority adopts the open space provision, SUDS components within the open space could also be adopted. In adopting these components, a range of issues will need to be addressed.

1. The primary purpose of the SUDS components is drainage. Use of open space for other purposes, such as nature conservation or as a play area, should not conflict with the effective working and maintenance of the SUDS.
2. Safety issues will come into play if a body of water is involved, but these can be dealt with by appropriate design and with effective communication with stakeholders.
3. There is a need to ensure that a long-term, effective maintenance regime is in place.

If SUDS are to be fully effective, they need to be managed properly. Section 106 of the Town and Country Planning Act 1990 provides a suitable mechanism by which properly designed SUDS components can be transferred into the management and maintenance responsibilities of a local authority. Model agreements to facilitate this process have been developed to accompany this Interim Code of Practice and can be found on CIRIA's SUDS website <www.ciria.org/suds/icop.htm>. Tables 5.1, 5.2 and 5.3 provide information on what can be adopted, assuming the system is designed and constructed in accordance with best practice.

Table 5.1 *SUDS ownership/maintenance by a local authority*

SUDS component		Adoption		Notes
		1	2	
Above ground	Pervious surface	✓	M	Where land ownership is taken under a S106 TCPA Agreement or S106 TCPA maintenance arrangements are in place.
	Filter strips	✓	M	Where land ownership is taken under a S106 TCPA Agreement or S106 TCPA maintenance arrangements are in place.
	Swales	✓	M	Where land ownership is taken under a S106 TCPA Agreement or S106 TCPA maintenance arrangements are in place.
	Bioretention areas	✓	M	Where land ownership is taken under a S106 TCPA Agreement or S106 TCPA maintenance arrangements are in place.
	Basins, ponds and wetlands	✓	M	Where land ownership is taken under a S106 TCPA Agreement or S106 TCPA maintenance arrangements are in place.
Below ground	Soakaways	✓	M	By using highway infrastructure, or by S106 TCPA Agreement.
	Infiltration trenches	✓	M	By using highway infrastructure, or by S106 TCPA Agreement.
	Filter drains	✓	M	Where land ownership is taken under a S106 TCPA Agreement or S106 TCPA maintenance arrangements are in place.
	Pipes	✓	L	By using highway infrastructure, or by S106 TCPA Agreement.

Notes

1 Can component be adopted: ✓ yes × no

2 Level of negotiation required: H = high, M = medium, L = low

The adopting authority will require independent validation that the SUDS has been constructed in accordance with the design and good practice and that it is an acceptable condition for handover. Before handover the SUDS will have to be inspected and any identified remedial works completed.

The developer will need to provide an owner's manual that includes a maintenance plan that properly addresses both initial and ongoing maintenance of the SUDS facilities. Such a plan should include additional dredging and cleaning during the development phase and, in the years following, cyclical maintenance requirements and recommendations for dealing with any material that may accumulate in the facilities.

5.2 HIGHWAY AUTHORITIES' POWERS TO ADOPT AND MAINTAIN SUDS

Highway drains are not public sewers and apart from connections from public surface water sewers to highway authority drains under Section 115 of the Water Industry Act 1991, there is no right to connect to them. There is no administrative or legal difficulty in installing SUDS, vegetative treatment systems or any other type of treatment systems in a highway authority's drainage system. The main difficulty is in finding land for them, particularly in the case of retrofitting. Similarly, maintenance is not an issue for a highway authority. Provided it is established that a vegetative system is an

appropriate choice that gives value for money it can be maintained by the highway authority as for any other part of the highway drainage system. Table 5.2 provides information on what can be adopted by highways authority, assuming the systems is designed and constructed in accordance with best practice.

Table 5.2 *SUDS ownership/maintenance by a highway authority*

SUDS component		Adoption		Notes
		1	2	
Above ground	Pervious surface	✓	M	Yes for adopted highways.
	Filter strips	✓	M	Yes for adopted highways
	Swales	✓	M	Yes for adopted highways
	Bioretention areas	✓	M	Yes for adopted highways
	Basins, ponds and wetlands	✓	M	Yes for adopted highways
Below ground	Soakaways	✓	M	Yes for adopted highways
	Infiltration trenches	✓	M	Yes for adopted highways
	Filter drains	✓	M	Yes for adopted highways
	Pipes	✓	L	Yes for adopted highways

Notes

1 Can component be adopted: ✓ yes × no

2 Level of negotiation required: H = high, M = medium, L = low

Highway authorities do have powers to adopt SUDS through a Section 38 Agreement. When entering into Section 38 Agreements, highway authorities seek certain specific drainage rights . The following text is typically used within the Section 38 Agreement to ensure that those rights are secured.

The Developer hereby warrants that he has the full right and liberty to drain the road or roads in the manner detailed in the Drawings in respect of such part of the surface water drainage system of the road or roads as are situate outside the limits of the road or roads and will forthwith execute or procure the execution by all necessary parties of such deeds as are in the opinion of the Council necessary to secure to the Council those full drainage rights and the Council shall not issue the final (adoption) certificate until such deeds are completed and further the Council shall not be liable for the payment of compensation or legal or other costs or fees arising on account of the execution of any such deeds.

5.3 SEWERAGE UNDERTAKERS' POWERS TO ADOPT APPROPRIATE SUDS TECHNIQUES

With conventional piped drainage systems a developer is normally required to construct a sewer in accordance with *Sewers for adoption* if it is to be adopted and maintained by the sewerage undertaker.

The standards and specifications set out in *Sewers for adoption* do not address SUDS, as sewerage undertakers are generally constrained to adopting only pipe systems that have a proper outfall and fall within the legal definition of a "sewer" (as defined in the Water Industry Act 1991). In addition, sewerage undertakers do not have a duty to accept flows from land drainage.

Table 5.3 provides information on the SUDS components that sewerage undertakers can adopt, assuming they are designed and constructed in accordance with a defined specification.

Table 5.3 *SUDS ownership/maintenance by a sewerage undertaker*

SUDS component		Adoption		Notes
		1	2	
Above ground	Pervious surface	×		Does not fall into statutory definition of sewer.
	Filter strips	×		Does not fall into statutory definition of sewer.
	Swales	✓	H	A swale taking surface water could be held to be regarded as a sewer provided it was designed to take surface water from buildings. However, it must have a "proper outfall", which will be decided on a case-by-case basis.
	Bioretention areas	×		Does not fall into statutory definition of sewer.
	Basins, ponds and wetlands	×		Does not fall into statutory definition of sewer.
Below ground	Soakaways	✓	H	Soakaways are not generally adoptable by sewerage undertakers, as they do not fall into the statutory definition of a sewer. In order for a soakaway to be held to be a sewer it must have a "proper outfall", which can only be decided upon the facts of a particular case or known design. This assumes therefore that the soakaway will be constructed in the form of a chamber with a specific outlet from it discharging into underground strata, with overflow to a public sewer, highway drain or a watercourse. In these circumstances a properly engineered soakaway taking drainage from more than one property could be held to be "other apparatus", as included in the definition of accessories in the Water Industry Act 1991, and therefore adopted. A series of soakaways could also be adopted with overflow discharges into a watercourse, other public sewer or highway drain.
	Infiltration trenches	✓	H	An infiltration trench could be held to be a sewer provided it was designed to take surface water from buildings allowing series of trenches to be adopted with a discharge to a public sewer, highway drain or watercourse. It must have a proper outfall, which will be decided on a case-by-case basis. It would be possible to resolve this by use of Section 115 of the WIA '91 to discharge from a surface water sewer into a highway drain provided there was a piped outlet.
	Filter drains	✓	H	A filter drain could be held to be a sewer provided it was designed to take surface water from buildings allowing a filter drain to be adopted with a discharge to a public sewer, highway drain or watercourse. It must have a proper outfall, which will be decided on a case-by-case basis. It would be possible to resolve this by use of Section 115 of the WIA '91 to discharge from a surface water sewer into a highway drain provided there was a piped outlet.
	Pipes	✓	L	If adopted as public sewer and built in accordance with *Sewers for adoption*.

Notes

1 Can component be adopted: ✓ yes × no

2 Level of negotiation required: H = high, M = medium, L = low

5.4 SUDS MANAGEMENT AND MAINTENANCE

It is important that an appropriate management regime is agreed between the developer and the adopting body. This should reflect the characteristics of the drainage system installed. Some key management stages of SUDS may include the following.

1. Initial construction and planting.
2. Intensive management to allow establishment.
3. First de-silting (especially on new developments during construction phase).
4. Maintenance (routine annual and major maintenance).
5. Rehabilitation.

Adoption would not normally take place until Stage 3 has been undertaken. Stages 1 to 3 can be clearly identified by the developers in their development proposals.

To ensure the continued performance and maintenance of SUDS infrastructure a specific source of revenue needs to be secured by the management body.

Responsibility for maintenance

Owners of all drainage systems are responsible for their maintenance and proper upkeep. If maintenance is not performed properly owners may be liable for damage caused due to failure of their drainage system.

5.5 FUNDING MECHANISMS

5.5.1 Local authorities

The local authority should secure a financial mechanism (through commuted sums or properly bonded arrangements), identified in the adoption agreement, to facilitate maintenance and management. This would allow adoption of the areas at an acceptable pace without placing burdens on the council's resources.

While local authorities can adopt SUDS infrastructure, ongoing maintenance can only be funded through agreements. The main mechanism for this has historically been through commuted sums taken from the developer. Larger SUDS infrastructure on new developments is likely to be coincident with the open space provision and is likely to be transferred to the local authority on completion.

5.5.2 Highway authorities

Highway authorities have considerable powers relating to surface water drainage and in principle could adopt SUDS. Although they do not receive additional government funding for drainage infrastructure there is nothing to prevent them from accepting commuted sums from developers in order to take responsibility for SUDS.

Though general powers exist for access to highway drainage systems for maintenance it is advisable to make proper provision at the time of installation, as maintenance operations of some types of system will be extensive, if infrequent.

HA103/01 (Highways Agency *et al*, 2001) contains specific advice on maintenance of vegetative treatment systems. This recommends that a management plan is drawn up to meet the site-specific needs of each installation.

5.5.3 Sewerage undertakers

Where a sewerage undertaker adopts a SUDS feature, the ongoing maintenance is secured through the surface water sewerage charge.

5.5.4 Major freeholders

If a major freeholder is not a public body but a private landowner or management company, the funding can be generated from a specific maintenance contract of budgeted allocation.

This arrangement would need to be bonded through a Section 106 Agreement to enable the local authority to take over the ownership and management of the feature should the arrangement fail. Sums could be drawn from this bond to fund maintenance as necessary.

CIRIA publication C625 *Model agreements for SUDS* (Shaffer *et al*, 2004) provides a model agreement for private SUDS within the curtilage of properties and can be used for smaller systems outside the requirements for planning permission.

6 Design considerations

6.1 SUDS DRAINAGE CONCEPTS

Traditionally, surface water runoff from new development has been conveyed without treatment via a system of public surface water sewers to watercourses. Highway authorities have generally (through developers) sought to include provision for surface water from highways within a prospectively adoptable public surface water system.

The design parameters for prospectively adoptable surface water sewers have been established by experience gained over many years and are set out in *Sewers for adoption*, which was first published in 1981. This publication has been regularly updated, as experience has been gained, to reflect the latest regulation, developments in materials and engineering knowledge. It sets design standards for the development site, and the consideration that needs to be given to downstream conditions and effects.

Experience has shown that surface water sewers designed in accordance with *Sewers for adoption* function satisfactorily to convey surface water from the vicinity of development. The impact of the resulting runoff on the receiving watercourse has been less well managed, in that the resulting runoff can cause flooding when the capacity of the receiving watercourse is exceeded, and can exacerbate diffuse pollution due to road runoff content.

The SUDS approach has a valuable role to play in reducing the rate and improving the quality of surface water runoff from development. Where such runoff could be a nuisance, cause deterioration in the quality of a watercourse, overload existing drainage or cause flooding to areas downstream, some means of control may be required through conditions imposed on new planning permissions.

The SUDS approach requires careful consideration of site conditions in order to develop an appropriate combination of techniques for any one site. For example, infiltration systems will not be appropriate where increasing the water content of the soil, or inducing a greater rate of flow of water through it, may increase the risks of instability or mobilise contaminants on a brownfield site. In these situations SUDS elements that do not rely on infiltration should be used.

6.2 SUDS DESIGN PRINCIPLES

CIRIA publication C609 *Sustainable drainage systems – hydraulic, structural and water quality advice* provides detailed information about SUDS design and performance considerations (Chapter 4). SUDS should be designed to meet certain criteria, but not all sites will need to meet all criteria. Early consultation with appropriate regulators should be undertaken to determine the appropriate design criteria.

When considering the hydraulic and water quality benefits of SUDS, it must be appreciated that, as with all drainage facilities, there is a design envelope (criteria for storm intensity, maintenance requirements, etc) which when exceeded will not prevent flooding, and routing for excess flows needs to be planned. Furthermore, neither SUDS nor traditional drainage techniques will prevent flooding of low-lying sites when the receiving watercourse has high water levels. Rather, SUDS can be used to attenuate the rate of surface water runoff from the area served where appropriate, thus offering some protection to downstream properties. If drainage systems are poorly implemented or maintained, the risk of flooding or pollution of sites downstream of the development area being served may increase.

The pollution removal capability of SUDS also has a design envelope and the pollution removal efficiency of the systems will vary throughout their life.

6.2.1 Designing for climate change

It is generally accepted that climate change is occurring. The precise effects on the climate of the UK are uncertain, but it is probable that some general trends will occur. Studies commissioned by the Department for Environment, Food and Rural Affairs (Hulme *et al*, 2002) indicate that over the next 70–80 years up to 2080, the following may happen:

- winters will be wetter and heavy rainfall will be more frequent in winter. There will be a 10–35% increase in winter rainfall volumes, depending on the region and assumptions made about global emissions of greenhouse gases
- in some areas of the UK the intensity of winter rainfall will increase by between 5 and 20%
- summers will be drier. There will be 35–50% less rainfall in summer across most of the UK, depending on assumptions made about global emissions of greenhouse gases
- the UK will be warmer. The annual average temperature in the UK will rise by between 2 and 3.5 °C
- there will be less snowfall across the UK.

Care needs to be taken when applying the above information to a SUDS design. The increase in rainfall intensity should be applied to the design storm intensities.

Some of the projected changes will improve the performance of some SUDS techniques – for example, increased temperatures will increase evaporation rates between rainfall events. The *Flood estimation handbook* suggests that the drier summers will lead to greater soil moisture deficits, which will reduce runoff for a greater proportion of the year. The time required to replace the moisture during winter could lead to a shorter “flooding season” and a reduced number of flooding incidents.

6.2.2 Designing for exceedance (flood routeing)

A drainage system that will never flood has to be extremely large and expensive. It is therefore normal practice to achieve a balance between the cost of a drainage system and the risk and consequence of flooding occurring. The balance needs to allow for various factors, including:

- the consequences of flooding, and consideration of safety. For example, flooding a landscaped area is more acceptable and less costly than flooding a property
- the cost of repair after flooding has receded.

To prevent flooding of the development and inundation of downstream drainage systems, provision must be made for appropriate management for flows generated in storm events that exceed the design standard of the drainage system as outlined in *Sewers for adoption*. If there are interactions with sewerage systems there is also a risk that excess flows will enter the foul or combined sewerage system, leading to sewage-related flooding.

6.2.3 Designing for amenity

Many SUDS components provide wildlife, ecological and aesthetic benefits. Well-designed SUDS can provide a valuable wildlife and local amenity. The pollution control function of SUDS means that they are likely to support only robust and pollution-tolerant species. Planting in SUDS components should make allowance for the pollution levels that are likely to occur and tolerant species should be used.

SUDS sites should not be identified as sites of special scientific interest (SSSI) or as protected conservation/wildlife zones. Most of the SUDS facilities will require some major maintenance work at some stage to ensure satisfactory operation. Legal protection should not obstruct these operations. However, the possibility of natural colonisation by protected species may need to be considered and advice should be sought from conservation agencies on the planning of maintenance schedules and on ways to handle any such species sensitively.

6.2.4 Designing for water quality improvement

Sustainable drainage systems can be designed to provide pollutant-removal mechanisms that mitigate against the risks posed to controlled waters. The main mechanisms include:

- sedimentation
- filtration
- biodegradation
- uptake by plants.

Further information on the specific pollution removal mechanisms is provided in CIRIA publication C609. The use of SUDS should also provide a benefit to water quality with the reduction in peak flows and total volumes to receiving waters.

6.2.5 Building Regulations considerations for managing surface water

Building Regulations, Part H3 Rainwater Drainage, places infiltration at the head of a hierarchy of methods of rainwater disposal, and recommends that storm sewers should be used only when discharge to the ground or a watercourse is not reasonably practicable.

Building Regulations stipulate that infiltration devices (soakaways etc) should not be within 5 metres of any building. This is due to potential impacts on foundations. However, it is possible to place infiltration devices nearer to buildings provided that there is no risk of ground or foundation movement being induced.

Where it is intended to use infiltration devices on sites that have very plastic clays or fine-grained soils or highly faulted or disrupted strata, geotechnical and hydrogeological evaluations should be carried out to determine whether the site is suitable for infiltration drainage and to determine the stand-off distance. On sites with stable conditions it may be possible, following a soil assessment and consultation with the foundation engineer, to reduce the stand-off distance.

If infiltration is to be used, the designer needs to have an understanding of the variations of water table level throughout the year and particularly when the ground is more likely to be saturated. This should be assessed by means of permeability testing and groundwater monitoring on the development site, ideally during the 12 months before construction. In the absence of monitoring data, a competent geotechnical engineer should assess the site. If local ground conditions have not been adequate for infiltration systems in the past then the presumption must be against the use of such techniques for new development. However, where water is not being concentrated such as in pervious pavements the risk of failure is lower than with conventional soakaways.

These results should be carefully assessed in order to proceed with suitable designs in accordance with BRE 365 *Soakaway design* (1991) and/or CIRIA Report 156 *Infiltration drainage– manual of good practice* (1996). Where discharge will be to ground above a deep aquifer, such as chalk, it is probable that the local Environment Agency office will have records of groundwater levels that could assist the designer. In addition, the developer or designer of the soakaway will need to consider site-specific groundwater vulnerability. Advice from or discussion with the local Environment Agency office is essential before construction starts.

6.2.6 Highway Agency considerations for managing surface water

Together with other national highways administrators, the Highways Agency has issued advice on the selection, design, construction and maintenance of vegetative treatment systems suitable for the control and treatment of runoff from major highways, including trunk roads and motorways. The advice is published as Advice Note HA103/01 *Vegetative treatment systems for highway runoff* (HA *et al*, 2001), within the *Design manual for roads and bridges* (DMRB) Volume 4 Geotechnics and drainage, Section 2 Drainage.

The vegetative treatment systems described in this advice note are suitable for use on all types of roads where its use is considered necessary for site specific reasons; additional types of systems, not included in the advice note, may also be suitable for minor roads.

Highway authorities routinely make use of DMRB although currently, with the exception of the strategic trunk road network for which the Highways Agency has responsibility, the majority of highway runoff from new development takes place directly through piped surface water systems, which usually are adopted as public sewers.

6.2.7 Site considerations for managing surface water

An appraisal of the suitability of different SUDS components for a development site must be carried out (there will potentially be synergies with the completion of a DIA). Such an appraisal will be initiated by an assessment of the existing natural surface water drainage (hydrology) on and off the site, which must take into account the following factors.

1. The topography of the site, particularly areas of floodplain and other flood-prone areas.
2. The relationship to watercourses (in natural condition and culverted or channelled), especially if they pass through the site.
3. Existing bodies of water, marshy or wet areas of ground.
4. Existing flow regime (high and low flow conditions).
5. Existing water quality.
6. Ecology in the watercourse corridor.
7. Groundwater levels.
8. Opportunities for environmental enhancements.
9. Current and future groundwater abstraction. If current abstraction by industry ceases or declines, higher water tables may result. This in turn may reduce the effectiveness, or limit the use, of infiltration techniques.

The natural topography of the site and any watercourses on the site should be seen as templates for the surface water drainage of the development through the implementation of appropriate SUDS techniques. Where development occurs on previously developed land, drainage work may involve topographically shaping terrain that has already been altered.

SUDS infiltration techniques should be located a suitable distance from watercourses so that they can function as intended, without the risk of a direct flow connection developing. The developer must consider the site-specific vulnerability of groundwater and the pollution risk from the infiltration system. The design criteria should allow for the variations in groundwater level that may arise, for example when watercourses are in flood or high flow states.

Land take

Some SUDS components require more land space than others. Although a site may be constrained by the available space this may not necessarily pose a barrier to the implementation of the sustainable approach, even on high-density urban developments. HR Wallingford is undertaking a project entitled “Use of SUDS in high density developments” that looks at ways of incorporating SUDS in such circumstances.

Health and safety

The design and construction of all drainage systems including SUDS must comply with the Construction (Design and Management) Regulations 1994. The construction, operation and maintenance of SUDS must comply with a whole range of health and safety legislation including, but not restricted to, the following:

- Construction (Health, Safety and Welfare) Regulations 1996
- Management of Health and Safety at Work Regulations 1999
- Control of Substances Hazardous to Health Regulations 2002 (COSHH).

There can be a perception that SUDS components, especially ponds and wetlands, pose a drowning risk. Other perceived risks include the overturning of vehicles into swales.

With careful design these perceived risks to public safety can be reduced. If ponds are properly designed with shallow side slopes, shallow shelving edges and strategically placed barrier vegetation they are at least as safe as many other watercourses, ponds and lakes that are unfenced in parks, country parks and similar locations.

It is good practice to undertake a safety audit or risk assessment of a SUDS scheme before the design is finalised to ensure that risks to maintenance workers and the public (especially children) have been designed out as far as possible. This may be incorporated into the risk assessments carried out to meet the requirements of the CDM Regulations.

Further information can be obtained from the Royal Society for the Prevention of Accidents (ROSPA) and in CIRIA publications C521 and C609.

Maintenance

Maintenance of SUDS differs from that needed for piped systems and is likely to require different skills. Effective maintenance helps ensure that SUDS function as they were intended and that the hydraulic capacity and pollutant-removal efficiency of SUDS is maintained.

The design of all SUDS should allow for easy access by people and vehicles to undertake maintenance. Many of the components used in sustainable drainage are above ground and understandable by people charged with maintenance of the systems.

CIRIA publication C609 provides further information on the maintenance of SUDS and the model agreements developed for use with this Interim Code

of Practice for SUDS should be used to help facilitate the ongoing maintenance of SUDS schemes.

6.2.8 Procedure for rainfall runoff management for developments

To ensure a uniform approach to consideration of the management of rainfall runoff for developments it is essential that consistent criteria be applied to analysis and design. HR Wallingford has developed an interim procedure for managing rainfall runoff from developments. It utilises well-recognised existing methods, but revision is anticipated to provide a more consistent approach as and when FEH procedures can be extended to catchments at development scale.

The objective of this procedure is to assist developers and their designers to conform to PPG25 and applies to both greenfield and brownfield sites.

In the case of brownfield sites, drainage proposals will be measured against the existing performance of the site (although it is preferable for solutions to provide runoff characteristics, which are similar to greenfield behaviour).

Drainage calculations and criteria, where appropriate, should comply with *Sewers for adoption* (5th edition) and CIRIA publication C609.

The objectives of the procedure are:

- for stormwater runoff discharged from urban developments to replicate or achieve a reduction from the greenfield response of the site over an extended range of storm probabilities (return periods)
- to manage runoff on site for extreme events
- to reduce pollution in receiving waters

This requires:

- the **peak rate** of stormwater runoff to be controlled over a range of storm probabilities
- the **volume** of runoff to be reduced over a range of storm probabilities
- the **pollution** load to receiving waters from stormwater runoff to be minimised
- the assessment of **overland flows and temporary flood storage** across the site.

The Environment Agency normally requires that, for the range of annual flow rate probabilities up to and including the 1% annual probability (1 in 100-year event), the developed rate of runoff into a watercourse should be no greater than the undeveloped rate of runoff for the same event. Volumes of runoff should also be reduced where possible. This can be achieved in two ways. Ideally, there should be minimal discharge to receiving watercourses for rainfall depths up to 5 mm. Alternatively, the difference in volume pre- and post-development for the 100-year six-hour event (the additional runoff generated) should be disposed of by infiltration, or if this is not feasible due to ground conditions, discharged from the site at flow rates below 2 l/s/ha.

The storage of excess flows from the 1 in 100-year event does not necessarily have to be within the drainage system. Where appropriate, storage for these volumes can be achieved by overland flow routeing and temporary surface flooding of areas such as car parks or landscaping.

Where compliance to 100-year volumetric criterion (as defined above) is not provided, the limiting discharge for 30- and 100-year return periods will be constrained to mean annual peak runoff for the greenfield site.

The calculation of peak rates of runoff from greenfield sites is related to catchment size. The values derived should be regarded as indicative because of the limitation of the existing tools. Table 6.1 summarises the approaches that may be used; whichever is adopted it should be agreed with the Environment Agency.

Table 6.1 *Tools to be used for calculation of greenfield runoff criteria*

Development size	Method
0–50 ha	The Institute of Hydrology Report 124 *Flood estimation for small catchments* (1994) is to be used to determine peak greenfield runoff rates. Where developments are smaller than 50 ha, the analysis for determining the peak greenfield discharge rate should use 50 ha in the formula and linearly interpolate the flow rate value based on the ratio of the development to 50 ha. FSSR 2 and FSSR 14 regional growth curve factors are to be used to calculate the greenfield peak flow rates for 1-, 30- and 100-year return periods.
50–200 ha	IH Report 124 will be used to calculate greenfield peak flow rates. Regional growth factors to be applied.
Above 200 ha	IH Report 124 can be used for catchments that are much larger than 200 ha. However, for schemes of this size it is recommended that the *Flood estimation handbook* (FEH) should be applied. Both the statistical approach and the unit hydrograph approach should be used to calculate peak flow rates. The unit hydrograph method will also provide the volume of greenfield runoff. However, where FEH is not considered appropriate for the calculation of greenfield runoff for the development site, for whatever reasons, IH 124 should be used.

Further information on the calculation of greenfield runoff can be found in CIRIA publication C609 and EA/Defra Technical Report W5-074/A *Preliminary rainfall runoff management for developments* (HR Wallingford 2004). A summary of the procedure can also be found on the Environment Agency website <www.environment-agency.gov.uk/suds> and on the CIRIA SUDS website <www.ciria.org/suds>.

6.2.9 Sustainable water management – rainwater harvesting

Developers, in consultation with planning authorities, should give consideration to the benefits and costs of rainwater harvesting, using sealed storage systems or tanks, to replace mains water for non-potable uses such as toilet flushing or garden watering. Design guidance and proprietary systems are available.

If rainwater is being collected as part of a sustainable drainage system in a water-stressed catchment, the incremental cost of making this rainwater available for non-potable household use may be both economically and environmentally justifiable.

Increasing awareness of the benefits of water-efficient devices, including rainwater-harvesting systems, by house builders, plumbers, product manufacturers and architects is starting to encourage uptake.

In general, rainwater should only be used for non-potable needs, such as toilets (around 30% of the total household water use) and garden watering. The savings depend on both the demand for non-potable water and the amount of water supplied, which is a factor of the roof area and local rainfall levels.

Changes in legislation are likely to encourage builders to consider environmental sustainability in their buildings. In the light of the flooding of recent years, planning conditions may impose stormwater discharge limits. Rainwater use systems can decrease the rate of stormwater release, reducing the need for more land-intensive techniques.

Further information on rainwater harvesting and rainwater use can be found in CIRIA publication C539 *Rainwater and greywater use in buildings* (Leggett *et al*, 2001) and *Harvesting rainwater for domestic uses: an information guide* (Environment Agency, 2003).

7 Model agreements

7.1 SUDS MODEL AGREEMENTS

The planning model agreements used in conjunction with this Interim Code of Practice are those provided by CIRIA publication C625 and have been based on a detailed legislation review and consultation. The model agreements are based on current legislation (March 2004). The model agreements can be found on CIRIA's SUDS website <www.ciria.org/suds/icop.htm>.

No conditions have been placed on the maintainer for the performance of the SUDS, as this would be impractical to measure. Instead, it is assumed that if the SUDS are properly designed, constructed and maintained they will perform in a satisfactory manner.

7.1.1 Model agreements

The aim of these model agreements is to facilitate uptake of SUDS by providing a mechanism for maintenance. The model agreements developed for use with this Interim Code of Practice achieve this through the planning process, either as a planning obligation under Section 106 of the Town and Country Planning Act 1990 or as a condition attached to planning permission. Table 7.1 and Figure 7.1 provide details about how the model agreements can be implemented.

Table 7.1 *Model agreements produced*

Reference	Title and description
ICoP SUDS MA1	**Planning obligation – incorporating SUDS provisions** Implementation and maintenance of SUDS either as a planning obligation under Section 106 of the Town and Country Planning Act, 1990 or as a condition attached to planning permission.
ICoP SUDS MA2	**SUDS maintenance framework agreement** Legal framework that defines which body takes over and maintains the SUDS.
ICoP SUDS MA3	**Model discharge agreement** A model deed in relation to owners of SUDS facilities granting sewerage undertakers rights in perpetuity to discharge, flood and maintain in default

Electronic versions (MS Word 97-2002) of the model agreements can be found by visiting CIRIA's SUDS website at <www.ciria.org/suds/icop.htm>.

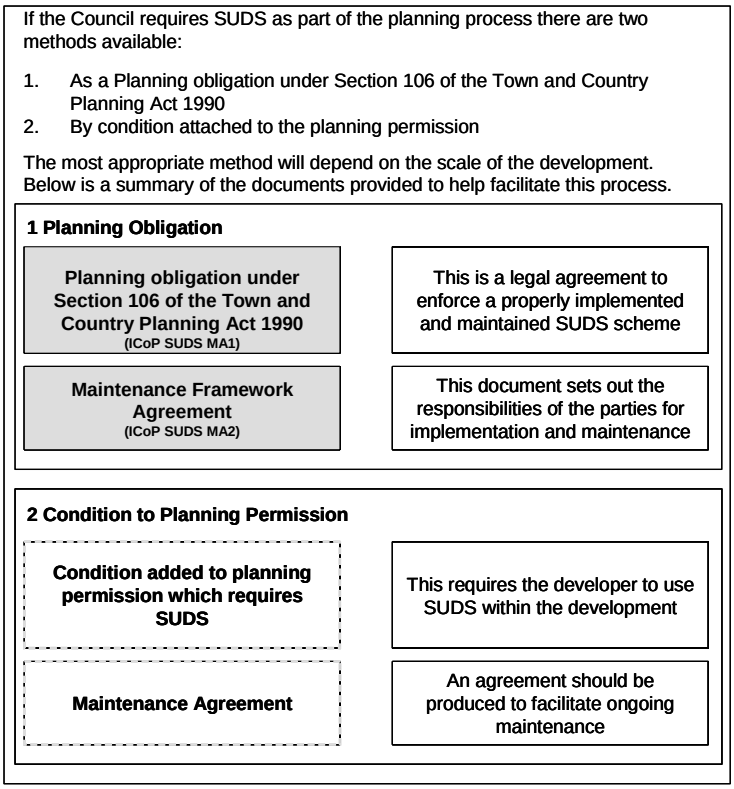

Figure 7.1 *Summary of planning documents provided*

7.1.2 Choice of route for SUDS development and maintenance

The local planning authority usually determines the choice of model agreement and the mechanism for implementation. A schematic showing the various processes involved is shown in Figure 7.2 where SUDS are required as part of the planning process.

The routes available to the local planning authority to ensure that the SUDS are properly implemented and maintained are:

- through an agreement under Section 106 of the Town and Country Planning Act
- by a condition to planning permission.

Where the scheme is small or the SUDS scheme is simple, the use of a planning condition may be the best option. However, appeals may be made against planning conditions and enforcement can be difficult. When SUDS are required outside of the Section 106 process, a private SUDS model agreement may be used to facilitate maintenance (CIRIA publication C625).

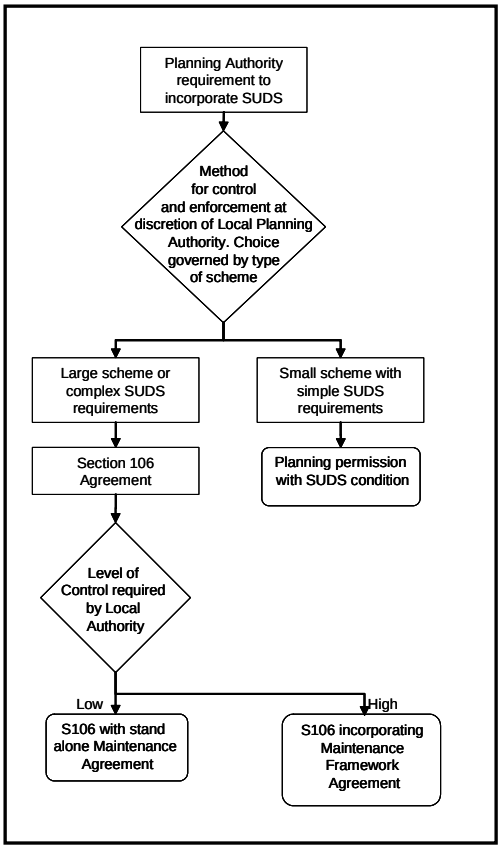

Figure 7.2 *Model agreement options with SUDS as a requirement of planning permission*

Where the development is larger or the SUDS scheme is complex the Section 106 approach should be used. For a large development scheme it is likely that a Section 106 agreement would already be implemented for other issues such as improved public transport or education. The Section 106 route requires negotiations and legal preparatory work in advance of the development taking place, but offers more security as it may only be varied by agreement. It also allows for financial contributions in the form of a bond or a periodic payment.

The Section 106 model agreement allows the option of including the maintenance agreement within it or having a stand-alone agreement. This again is at the discretion of the local planning authority. The choice should be governed by the degree of control the local planning authority would like to have over the maintenance issues. Where greater control is required the maintenance framework agreement should be used and incorporated as part of the Section 106 agreement.

Where local planning authorities seek to incorporate SUDS within developments using these methods, they should seek independent legal advice to ensure that the most appropriate method is used. Some changes to the standard document will almost certainly be required for each individual situation.

8 References and further information

ADAS (1982)
The design of field drainage pipe systems
ADAS Report 345, HMSO, London

Bettess R, Davis A and Watkins D (1996)
Infiltration drainage – hydraulic design
Project Report 23, CIRIA, London

Bettess R (1996)
Infiltration drainage – manual of good practice
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Notes

1. Published jointly by the Highways Agency, Scottish Executive Development Department, National Assembly for Wales and Department for Regional Development, Northern Ireland, in the *Design manual for roads and bridges* (DMRB).

8.1 ORGANISATIONS, ACRONYMS AND WEBSITES

Organisation	Acronym	Website
Building Research Establishment	BRE	http://www.bre.co.uk
Construction Industry Research and Information Association	CIRIA	http://www.ciria.org http://www.ciria.org/suds
Department for Environment, Food and Rural Affairs	Defra	http://www.Defra.gov.uk
Department for Transport	DfT	http://www.dft.gov.uk
English Nature	EN	http://www.english-nature.org.uk
Environment Agency	–	http://www.environment-agency.gov.uk
Highways Agency	HA	http://www.highways.gov.uk
House Builders Federation	HBF	http://www.hbf.co.uk
Institute of Hydrology	IoH	http://www.nwl.ac.uk
Institution of Civil Engineers	ICE	http://www.ice.org.uk
Local Government Association	LGA	http://www.lga.gov.uk
National Assembly for Wales	NAW	http://www.wales.gov.uk
Water Demand Management Centre	–	http://www.environment-agency.gov.uk/savewater
Office of the Deputy Prime Minister	ODPM	http://www.odpm.gov.uk
Office of Water Services	OFWAT	http://www.ofwat.gov.uk
Planning Officers' Society	POS	http://www.planningofficers.org.uk/pos
Scottish Environment Protection Agency	SEPA	http://www.sepa.org.uk
Water Regulations Advisory Scheme	WRAS	http://www.wras.co.uk
Water Research Centre plc	WRc	http://www.wrcplc.co.uk
Water UK	–	http://www.water.org.uk

Sustainable drainage systems aim to mimic as closely as possible the natural drainage of a site in order to reduce the impact of development on flooding and water pollution.

This Interim Code of Practice for Sustainable Drainage Systems provides a strategic approach to the allocation of maintenance for Sustainable Drainage Systems in England and Wales. The Interim Code of Practice has been developed in conjunction with a set of model agreements allocating responsibilities for maintenance and refers practitioners to detailed technical guidance rather than duplicating information.