Range of SUDS components: The following table summarises the various types of SUDS from constructed ponds through to trees. Visit susdrain.org for useful case-studies and advice on each type.

Component	Brief Description
Constructed ponds and wetlands	Permanent pools of water which are used to store and treat surface run-off. Landscaped to improve pollutant removal and enhance wildlife habitat.
Bioretention areas	Shallow landscaped areas with engineered gravel and soil layers which convey, filter and treat water.
Extended Detention Basins	Vegetated basins designed to detain a certain volume of runoff as well as providing water quality treatment.
Filter Drains and Perforated Pipes	Surface water from the edge of paved areas flows into shallow stone filled trenches. The water is filtered and conveyed to other parts of the site. A slotted or perforated pipe may be built into the base of the trench to collect and convey surface water.
Filter Strips	Wide, gently sloping areas of grass or other dense vegetation that allow conveyance and infiltration (if suitable).
Green roofs	Vegetation covering a building's roof. Green roofs are laid over a drainage layer to create a living surface which intercepts, stores and absorbs water.
Infiltration systems	Designed to collect and store runoff and enables water to infiltrate into the ground. Infiltration basins may be landscaped to provide aesthetic and amenity value.
Pervious paving	Allows rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration into the ground.
Rainwater harvesting systems	Used to collect and store run-off from roofs or paved surfaces.
Swales	Broad, shallow channels covered by grass or other suitable vegetation. Swales are designed to convey and/or store runoff, and can allow infiltration of water into the ground (if ground conditions allow).
Trees	Trees planted within specially designed pits, planters or structural soils to collect, store and treat surface water run-off.

Integrated design: SUDS should be fully integrated into the layout and the green and blue network. Fronting buildings onto attractive SUDS features can create a pleasing outlook as well as a focal point within the development. Image: Lionthorn, Falkirk

Technical Guidance: SUDS schemes should comply with the CIRIA SuDS Manual (C753) and, where the scheme is to be vested by Scottish Water, Sewers for Scotland (current edition). SUDS that are intended to drain water from an adopted road should be designed in accordance with SUDS for Roads.

Multi-functional: Using SUDS as a placemaking tool, and keeping water management above the ground, can enhance the surrounding environment and achieve a range of benefits. Bertha Park, Perth is a good example of integrating attractive SUDS with other functions including play provision, biodiversity, active travel and housing. Image: Bertha Park, Perth

SUDS landscaping: Appropriate marginal planting can help to integrate ponds into the landscape, create habitat and encourage wildlife. Image: Carrongrove, Stoneywood

Mixture: Developments typically have a SUDS scheme, usually a pond or basin at the bottom of the site. Using a mixture of SUDS such as ponds, swales, green roofs, trees, rainwater gardens etc. throughout the site can help create an attractive and linked green and blue network, mimicking nature and the SUDS management train. Images: Commonwealth Games Athletes' Village, Glasgow

Water storage and reuse: Rain water harvesting systems can be a relatively simple way of storing surface run-off from the roof of a development. They can provide an alternative source of non-drinking water for garden use, toilet flushing, car washing and even some industrial processes. The example shown here is the100 litre ‘prestige wall mount water butt’ from Freeflush Limited. Other manufacturers, designs and capacities are available.

Shapes and slopes: Natural shapes and slopes can achieve a natural feel within the design of SUDS ponds/basins (Mungal Park, Falkirk, top and below left). Overly rigid shapes and very steep slopes should be avoided as these can make ponds/basins look over-engineered and, in some cases, resemble a crater with low amenity value (Redding, top and below right).

Access for maintenance: Where access to ponds and basins is necessary for maintenance, access tracks should be unobtrusive and integrate with the open space of which they are part, for example through the use of reinforced grass systems. Images: Carrongrove, Stoneywood

Enclosures for SUDS basins and ponds: In low safety risk schemes, consider soft landscaping as a natural alternative to fencing. Transition planting around the margins can act as an effective visual cue deterring people from the water edge (Bertha Park, Perth, below left). Fencing, if needed, should be sited, designed and finished to be as inconspicuous as possible. Low hedging (Lionthorn, Falkirk, below right) can help soften the appearance of fencing while still maintaining views of the water area for natural surveillance.

Retrofitting: De-greying infrastructure through rainwater gardens can help tackle surface water flooding and pollution problems at an early stage as well as soften the surrounding built environment. Image: Ribblesdale Road, Sherwood (Nottingham City Council)

Further guidance

10,000 Raingardens for Scotland website

CIRIA SuDS Manual (C753)

Falkirk Council Planning Application Advice on Flood Risk and Surface Water Drainage

Forth Estuary and Forth Flood Risk Management Strategies and Plans

Forth Area River Basin Management Plan

NatureScot website

PAN61: Planning and Sustainable Urban Drainage Systems

Scottish Water's Surface Water Policy

SEPA guidance and advice notes for planning

Sewers for Scotland (current edition)

SG07 - Biodiversity and Development

SUDS for Roads

SUDSWP's Water Assessment and Drainage assessment Guide

SUSDRAIN website

Water, People, Places - A guide for master planning sustainable drainage into developments

Urban Design London's Designing Rain Gardens: A Practical Guide

9. WATER: RESTORING THE WATER ENVIRONMENT

Key Principles

- **Development should safeguard, and, where possible, enhance the water environment.** Improvements to the water environment may be achieved by development for example through deculverting, remeandering, removing redundant structures or barriers to fish passage, and enhancing bankside habitat.
- **An appropriately sized buffer should be provided** between development and a waterbody to maintain natural fluvial processes and to protect the water environment.
- **Unnecessary engineering works in the water environment should be avoided** including new culverts, bridges, watercourse diversions, bank modifications or dams.
- **New or enhanced public access to a waterbody should be provided**, where appropriate, to allow access for a wide range of users.

Key LDP Policies

PE01 Placemaking

PE13 Green and Blue Network

PE19 Biodiversity and Geodiversity

PE22 The Water Environment

PE24 Flood Management

IR02 Developer Contributions

IR10 Drainage Infrastructure

Good Practice

River access in an urban setting: Some locations provide opportunities to improve active travel links to nearby rivers and waterbodies, connecting people with nature and the wider green and blue network. Images: canal path at Canavan Court/Park, Falkirk (below left) and Commonwealth Games Athletes' Village, Glasgow (below right)

Buffer Strips: A buffer strip is an area of permanent vegetation between development and a watercourse. It can provide many environmental benefits from habitat connectivity, better water quality through to reduced soil erosion and improved flood risk management. The table below provides minimum widths for a buffer strip based on the width of the watercourse. Depending on site conditions, some strips may need to be wider than the relevant minimum buffer width stated. A buffer of at least 3m may be required for ditches.

Width of watercourse (measured between the top of banks)	Minimum width of buffer strip (either side of the watercourse)
Less than 1m	6m
1-5m	12m
5-10m	15m
10m+	20m+

Deculverting: Culverts can contribute to local flood risk, becoming blocked and/or quickly conveying water downstream. They have low ecological and amenity value being constructed from concrete channels with little daylight. Delculverting can restore a natural flow regime, benefitting sustainable flood management, placemaking and biodiversity. Images: Bog Burn, former British Leyland site, Bathgate, West Lothian (SEPA).

Wildlife ditches, ponds and wetlands: These can help create important aquatic and semi aquatic habitats for native species as well as contribute to sustainable water management and amenity. Image: Jupiter Urban Wildlife Centre, Scottish Wildlife Trust, Grangemouth

Regeneration: Zetland Park's paddling pool is to be transformed into a new wildlife feature as part of Heritage Lottery funded plans to regenerate the park. The project is an innovative example of using the public realm to create an attractive water space for both wildlife and people. Image credit: LUC

Removing barriers: The removal of an old weir and creation of a fish ladder with a new hydro scheme on the River Carron as part of the redevelopment of the Carrongove site in Stoneywood has improved upstream access for salmon and sea trout.

Other Useful Guidance

CIRIA SuDS Manual (C753)

Forth Estuary and Forth Flood Risk Management Strategies and Plans

Forth Area River Basin Management Plan

SG07 - Biodiversity and Development

SEPA's guidance and advice notes for planning, in particular the 'Background Paper on the Water Environment'

River Restoration and Biodiversity - Nature-Based Solutions for Restoring the Rivers of the UK and Republic of Ireland

Rivers by Design - Rethinking development and restoration