

A large blue graphic shape, resembling a stylized '1' or a drop, is positioned in the upper left quadrant of the image. It overlaps the photograph of a river scene.

Reducing flood risk, creating natural spaces for children to play, wildlife to flourish and communities to meet.

How can we make our rivers and streams run smoothly and cleanly through our city?

Can SuDS be the answer to water management in Peterborough?

Sustainable Drainage Systems



SuDS

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What are SuDS?

Sustainable Drainage Systems (SuDS) are a new way we can manage rainfall in our landscape and community.

Rainfall that used to be collected in gullies and pipes under the ground can now be managed more naturally in the landscape to mimic the way water behaves in nature.

So what is wrong with how we manage rainfall now?

To explain this, we need to take a journey through time and look at how rainfall has been managed through the ages...



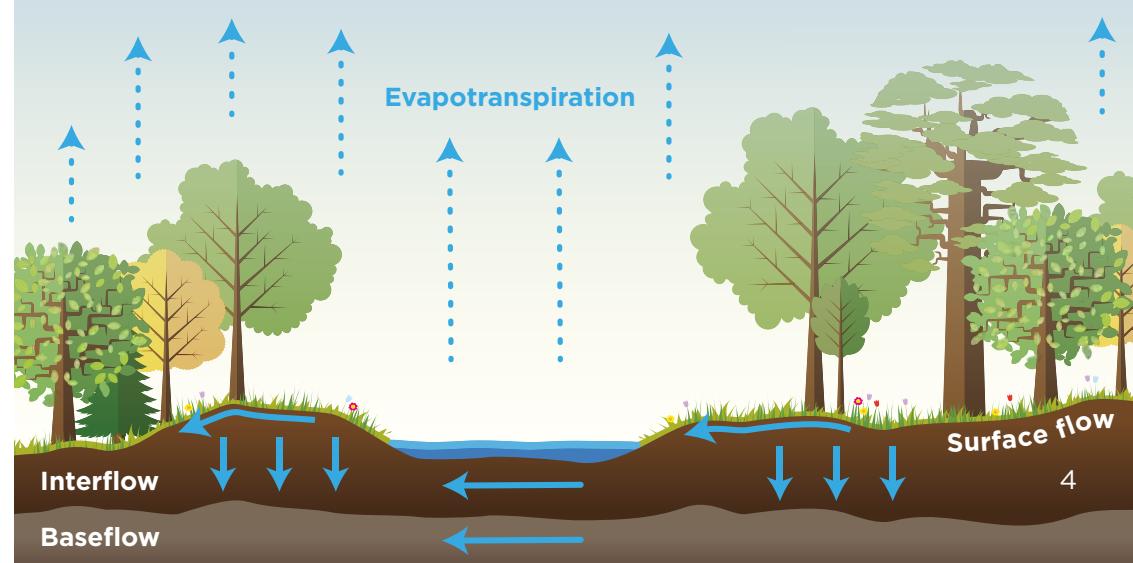
Once upon a time... when water flowed in a natural landscape

Rain fell onto a landscape of forests, glades and wetlands before trickling slowly to streams and rivers on its return journey to the sea. Some of the rain would evaporate back into the air or be lost as trees and plants breathed water vapour from their leaves. More rain would soak naturally into the ground and flow through the soil into streams and rivers, or collect in wetlands and ponds.

As long ago as the Stone Age, people began to clear the land for pasture and cultivate fields for crops. They built ditches, dykes and earth banks to carry water from their settlements to the nearest place where water would flow away quickly to a stream or river.

And so the history of drainage by people began.

What happens in a natural landscape?





PIPE IT!

The pipe solves one problem but creates another



This cartoon, published in Punch in 1855, depicts the foul state of the River Thames.

Image courtesy of Wellcome Library, London

With the development of large industrialised cities came pollution.

Watercourses were overwhelmed by surges of rainwater and waste, causing flooding with filthy water that led to unbearable smells and outbreaks of disease. Finally 'The Great Stink' outside parliament resulted in action.

Victorian engineers solved the immediate problem by building a network of increasingly large pipes to carry this mixture of rainwater and sewage to rivers and the sea, further from the towns and cities.

This was the age of the 'combined sewer'.

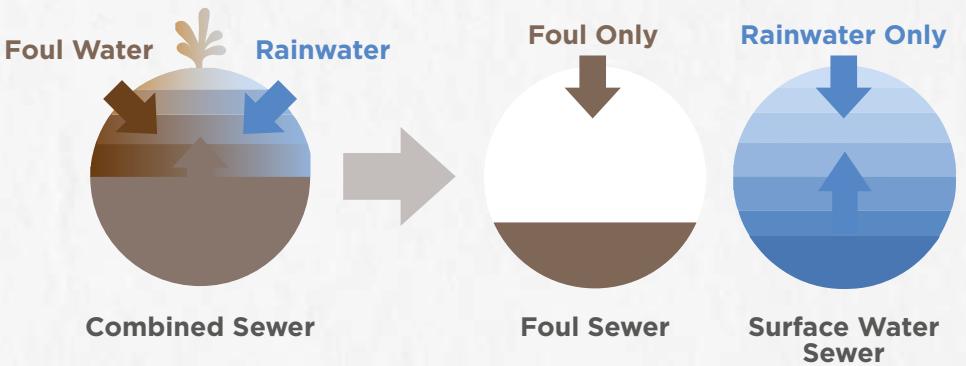
However this created a further set of problems for another generation. We realised that mixing our waste with unpredictable volumes of rainwater was not a sensible way to care for this valuable resource, as this brought about a severe loss of water quality.

SEPARATING THE FLOWS

One problem with the combined sewer is that, in heavy rainfall, the pipes aren't large enough to carry all the extra rainwater mixed with sewage and so they overflow into rivers and streams causing flooding and pollution. It also means that what once landed as clean rainwater is needlessly pumped and treated in sewage treatment works.

During the 20th century we tried to separate waste water from clean rainwater by building two pipes:

- The Foul Sewer carries sewage to treatment works
- The Surface Water Sewer carries rainwater to streams, rivers or the sea



However, rainwater often still gets into the Foul Sewer, causing overflows and overloading of the sewage treatment works. Due to broken and poorly connected pipes, waste water also commonly finds its way into the Surface Water Sewer. Added to this, rainwater flowing off roads and car parks into the Surface Water Sewer can be quite polluted. This increases flood risk and contaminates our streams and rivers, killing wildlife, reducing the overall health of the rivers and making them more dangerous places to swim or paddle.

"It seems the pipe is not the solution to managing rainfall after all"

LEARNING FROM NATURE

SuDS deals with rainwater in a different way

Sustainable Drainage Systems (SuDS) mimic the way nature manages rainfall.

SuDS take inspiration from natural features and processes like uptake of water by plants, soil infiltration, pools, ponds, marshes, wetlands, springs, streams and rivers.

SuDS work by holding rainwater back, treating pollution and releasing it slowly, without overwhelming the watercourse or sewer system into which it flows, thereby reducing flooding.

They deliver a controlled flow of clean water to the environment.

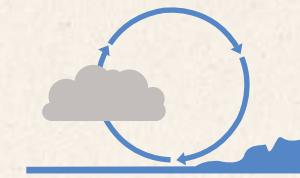
SuDS is a holistic approach to managing rain fall.



Rainwater is collected in new ways.



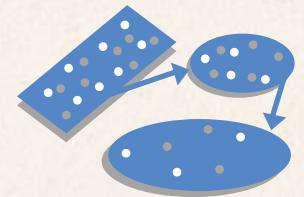
Rainwater is stored for a short time to reduce flooding.



People are reconnected with the natural water cycle.



Flowing water can be used to create beautiful places.



Runoff is cleaned close to where it lands.



Water is released slowly to protect streams and rivers from erosion.



Existing drains are protected from surges of water.



Clean water flow supports wildlife.



Red Hill Church of England Primary School, Worcester

This 'swale maze' beneath old Lime trees at Red Hill school is a special place for play, teaching and wildlife on most days until rain turns it into an adventure playground. The school re-development uses swales, basins, filter strips, permeable pavement, a green roof and rainwater harvesting to demonstrate how all these features can be used to reduce flooding, clean runoff and create exciting places for people and wildlife.

SuDS Features



Green Roofs

Roofs can be planted to form green roofs which soak up some rain and filter out pollutants. They can also be designed as 'brown roofs' which allow nature to colonise naturally or even 'blue roofs' which have valuable wetland habitat on them.



Permeable Pavement

Hard surfaces can be designed to allow water to pass through, rather than run off, the surface. This allows the water to be naturally treated to remove pollutants and stored in the stone beneath the paving.



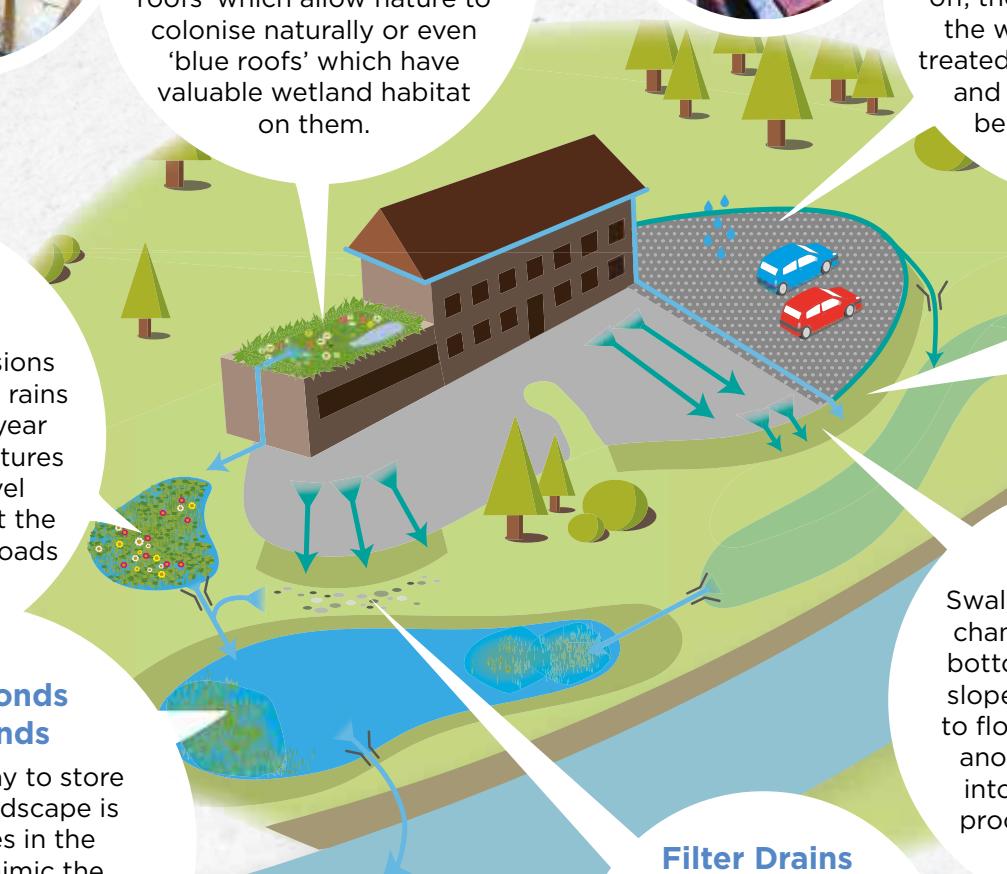
Raingardens & Bioretention

These planted depressions can store water when it rains but look beautiful all year round. Bioretention features have additional gravel filtration layers to treat the extra pollutants from roads or car parks.



Basins, Ponds & Wetlands

The simplest way to store water in the landscape is to use features in the ground that mimic the natural temporary pools, ponds and wetlands that used to be so common in the English countryside.



Filter Strips

Gently sloping grass next to a hard surface can filter out pollutants as water flows over the surface toward the next SuDS feature.



Swales

Swales are shallow grass channels with wide, flat bottoms and gentle side slopes. They allow water to flow from one place to another and let it soak into the ground in the process. They can also store water.



Filter Drains

These gravel filled trenches filter out pollutants and allow the water to soak into the ground or move through the trench to the next part of the system.

Fort Royal School, Worcester

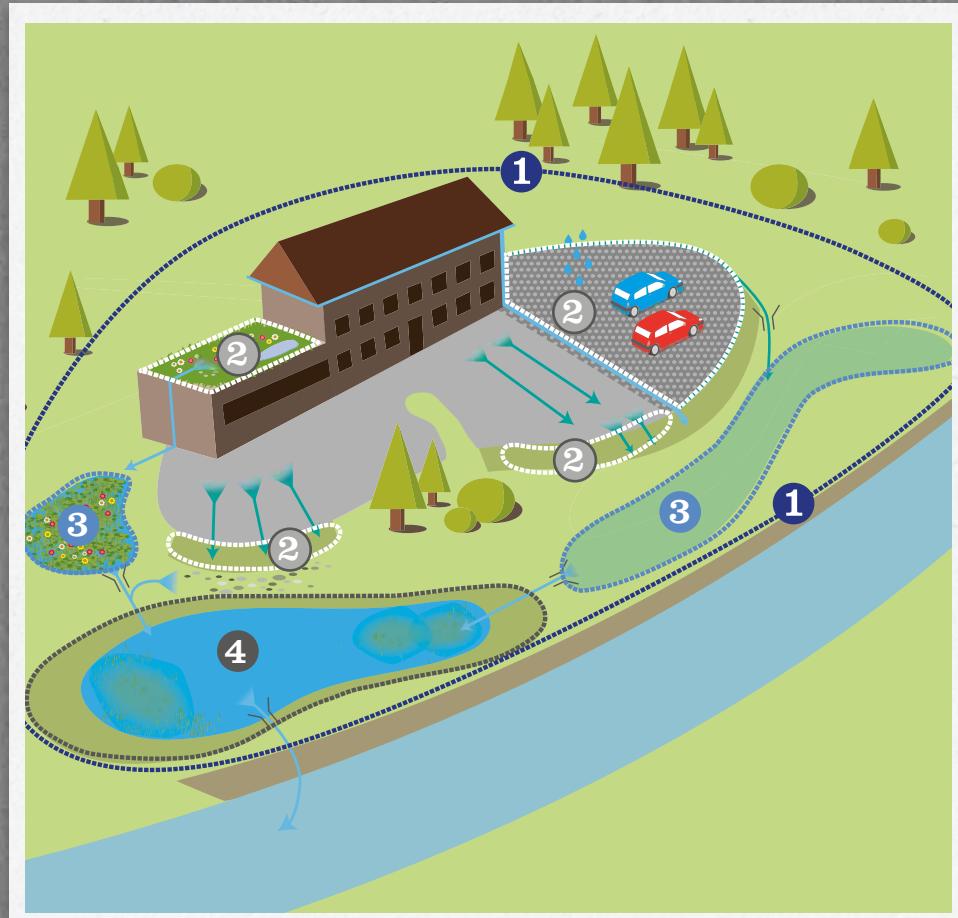
This city centre school looks after children with special needs.

Two flow routes carry runoff from roofs, playgrounds and car parks through a series of SuDS features to a fenced wildlife pond. Visual and sensory details provide interest when it rains and include rain chains, rain slides, spouts and a raised pond with a viewing window. Water brings the landscape to life when it rains.



We call the sequence and choice of SuDS features that collect, hold back and clean the flow of runoff from development

'The Management Train'



Prevention

Prevention measures avoid pollution and spillages happening in the first place and reduce the impact of surface flows by ensuring flow routes are clear of obstructions. All runoff must be dealt with by the SuDS management train and not be allowed to bypass flow controls or treatment features.

1

Source Control

Runoff should be collected as soon as possible after it falls as rain, in order to slow the flow and begin treatment of pollution 'at source'.

2

Site Control

As runoff flows through a development, SuDS features store water and continue the cleaning process.

3

Regional Control

Where development is next to Public Open Space (POS) then occasional volumes of clean water can be managed in amenity SuDS features like basins, ponds or wetlands.

4

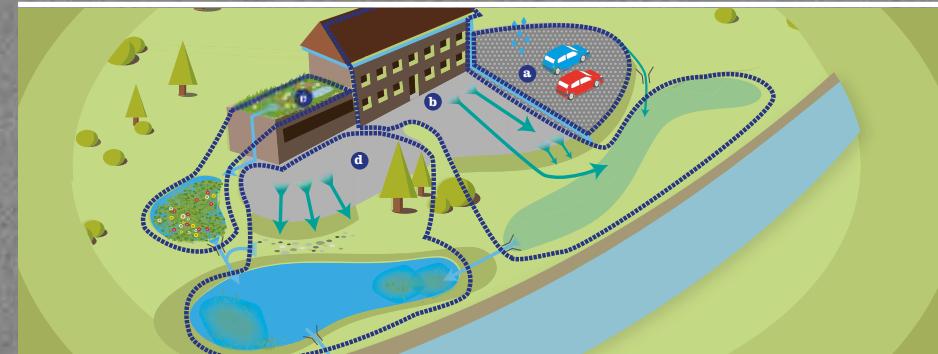
New ways to look after water

1

Storing water throughout the development

- Creating ‘sub-catchments’

Developments can be divided up into smaller areas that look after their own rainfall. These are called ‘sub-catchments’. Each sub-catchment collects, cleans and stores runoff, releasing a controlled flow of clean water to the next part of the SuDS or to the natural environment.

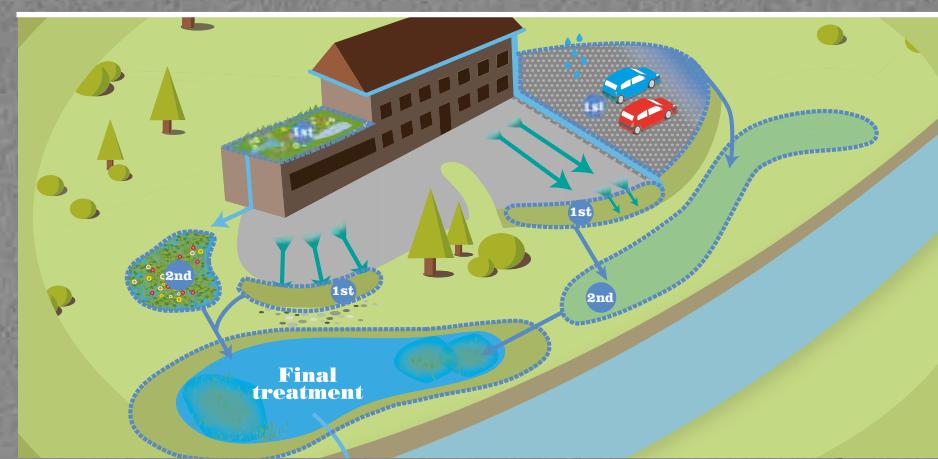


2

Treating pollutants in the water

- Using different ‘treatment stages’

As rain lands on our buildings, roads and car parks it picks up pollution that comes from vehicles or the air. Each SuDS feature helps clean the runoff. Depending upon the amount of pollution expected to be carried by the runoff and the vulnerability of the watercourse where the water will end up, the water will be required to pass through a certain number of properly sized SuDS features to sufficiently clean the water. We call these ‘treatment stages’ and where more than one are required, they should be made up of different SuDS features to give different types of pollution treatment.

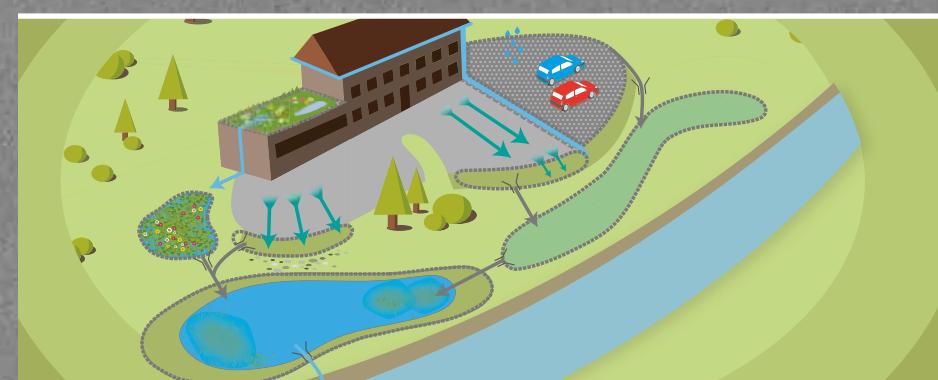


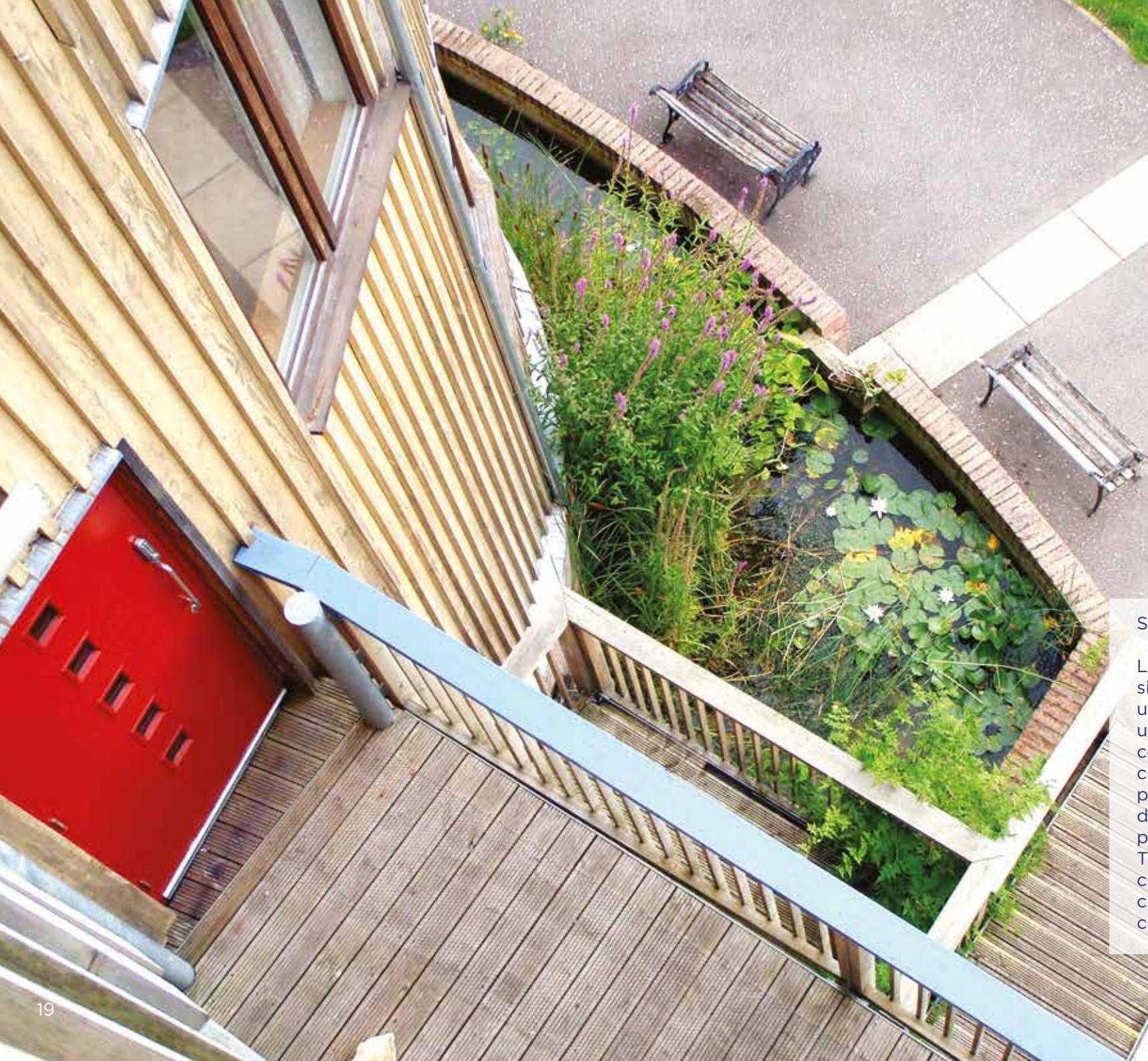
3

Making the best use of available space

- The ‘storage hierarchy’

SuDS allow water to be stored close to where it falls as rain, in features like permeable paving, swales, ponds and wetlands. These small storage features are easily integrated into an attractive and useful landscape making the most of the available space. They are also robust, cost-effective and can enliven our surroundings every time it rains.





Springhill Housing, Stroud.

Located on a steeply sloping site in the centre of Stroud, this unusual Cohousing development uses permeable pavement to collect, clean and store road and car park runoff with roof and pedestrian street water flowing down rills and cascades into pools and a grassy play basin. The SuDS help define the character of the neighbourhood creating a beautiful landscape that can be managed by the residents.

Living with SuDS

Living with SuDS will be a new experience for many of us because we are used to water being out of sight and therefore out of mind.

How do SuDS work?

Will it be safe?

What will it look like?

The design of SuDS provides safe places where we can enjoy the delights water brings to our lives. The most common concern, particularly of parents, is how we live with open water in the landscape.

Don't worry!

SuDS features should contain clean water at shallow depths when it rains and most types of feature should be dry most of the time. Slopes should be gentle, with level strips next to shallow open water and edge planting to act as an informal hedge. The water should be visible to everyone and, if unsupervised toddlers are likely, have a low 'toddler-proof fence' that older children and adults can step over easily.



A new, better journey for rainwater



Instead of rain disappearing down a hole in the ground, it will flow at or near the surface, from one SuDS feature to the next, creating beautiful places for people and wildlife.

We will see how rainwater begins its journey to the sea, flowing through SuDS before it joins a stream or river as a controlled flow of clean water that supports healthy rivers and seas.

Our communities will be part of a cleaner, healthier and safer water environment.





**Robert Bray
Associates**

Sustainable Drainage Consultants
Landscape Architects