

LONGER-LASTING SUDS

Storm drains once seen as the solution to flooding are now being seen as the cause. **Andrea Hughes** of consultancy Mayer Brown charts the change in thinking



The land drain at the Newlands site



opportunity to soak initial volumes of rainfall into the ground. The grass provides a filtering system for polluted sediment and through the use of check dams or landrain outfalls run-off arrives at the receiving water in lower quantities, over a longer period.

These controlled flows can be drained into balancing ponds, attenuation basins or wetlands, where they can be retained and allowed to drain back into the receiving waters over time. These features provide further pollution treatment, through filtration, settlement and biological processes. They additionally provide community recreational facilities, wildlife habitats or just a pleasant visual amenity.

However, while SUDS techniques are becoming more and more common in construction projects, there has been limited research in the UK, the South in particular, on the results of implementing SUDS and the success with which it achieves a more 'natural' drainage regime.

CASE STUDY

A 298-hectare area of farmland to the West of the town of Waterlooville in Hampshire, known as Newlands Common, is one of the sites that was identified in the South East development plan as being suitable to provide around 2,000 of the new houses required.

The site is located within the upland catchment of the River Wallington. Therefore, for an application for development of this site to be successful, it was imperative that all of the stakeholders were satisfied that on-site flooding and downstream impacts would not be an issue.

From the outset of this particular project, it was recognised that if the principles of SUDS were properly applied and if all stakeholders were brought to the table at the earliest stages of design, it had the potential to become a national case study for SUDS and what can be achieved.

The Newlands Major Development Area (MDA) therefore presented a major opportunity to study the pre- and post-development effects of SUDS. This opportunity was recognised by project engineers Mayer Brown, site owners Grainger plc and the Environment Agency (EA) and as a result, a unique partnership was forged in order to use the MDA as a research project. More recently, the University of Portsmouth have joined the project, and with funding from the South East England Development Agency (SEEDA) have employed a research associate for the project.

Since 2003, all major stakeholders have been involved in the evolution of this project. Extensive, formal liaison has taken place in the form of SUDS working and steering groups. These meetings take place on a regular basis and include technical

AS BRITAIN prepares itself for the potential of yet another autumn of flooding, the question of how to provide the 28,000 new houses per annum required by the South East plan, without exacerbating existing flood problems, remains a difficult one.

It is now widely recognised that land use plays just as an important role in the origin of flooding events as the weather. Historically, towns and cities have built up around rivers and coastal areas and when flooding occurs, it is inevitably the adjacent citizens who bear the brunt. In more recent years however, this problem has been exacerbated by land use patterns upstream.

In a 'greenfield' environment, rainwater falls on the river catchment and a significant proportion percolates through the soil. The proportion that does not recharge the groundwater table, evaporates, or evapo-transpires, eventually ends up at the outfall point of the catchment. Crucially in a greenfield system, the time taken for this to occur will vary depending on where the rain has fallen in the catchment, the duration of the rainfall and the saturation of the ground due to previous rainfall. Where the catchment is large, the rainfall is short duration and the ground is unsaturated, the observed peak in outfall can be minimal.

However, the increased urbanisation of catchments has resulted in the loss of this natural control mechanism. With the result that rainfall is now being much more rapidly conveyed to the outfall point, thus

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creating a large peak flow, much increased total volume and potential flood conditions.

The other main issue associated with these 'peaky' run-offs is that the rush of water entering the outfall from the urban catchment usually brings with it a flush of polluting substances. This can result in the deterioration of the area around the outfall and the loss of species both here and further downstream.



Sustainable drainage systems or SUDS, is an alternative approach to the management of surface water drainage, which strikes a balance between the management of surface water run-off and the need to conserve natural resources. Three of the main principles of SUDS are:

- **Reduction of quantity** – in particular the large peak run-off rates and total volumes during a storm event
- **Improvement of quality** – by reducing the level of pollution entering the receiving waters
- **Enhanced amenity** – such as community facilities, landscaping potential and wildlife habitats.

One of the techniques employed to achieve these goals is the use of pervious paving. This allows water to filter through hard paved areas in much the same way as it would in the original green field scenario. It also provides the opportunity for run-off to be filtered before entering the receiving waters.

Another engineering solution is the use of swales. These are green corridors which remain as shallow grassed indentations in the landscape until it rains. They then provide a route for rainfall run-off and an

TOP: Newlands balancing pond under construction

LEFT: The Newlands Common site, just outside Portsmouth



The Newlands Common development is a flagship project for the Environment Agency'

LEFT: A swale under construction at the flagship development

"The Environmental Technology Research Group at the University of Portsmouth has a track record of research into reed beds and ponds for treating wastewater and managing surface run-off. The Newlands site offers an ideal site for the Group to study SUDS performance as the partnership that exists between the developers, Mayer Brown, the Environment Agency and the University of Portsmouth has allowed baseline conditions in the local watercourses to be established and monitoring considerations to be incorporated in the SUDS design.

Jones and Kim Smith from the EA and we felt that with this commitment there was an opportunity to consolidate all aspects of SUDS into this one project. Developers are not adverse to SUDS and usually resistance arises because of the bureaucracy and red tape between the authorities. This normally relates to who will adopt the SUDS system and fear of the unknown. We're hoping that as a result of the Newlands research project we'll see a guidance note 'SUDS for adoption' which will help others incorporate SUDS into their development projects.

"This research will make a major contribution to increasing the understanding of the treatment processes in SUDS and provide case study material to promote their use at other new developments."

"As a developer of large schemes on a national basis we often experience that one EA office has a different approach to SUDS than another. Having a publication providing guidance based on real life research will no doubt help to ensure that there is a consistent approach to SUDS."

The client, Grainger Plc, has been very satisfied with the outcome of this long term consultation and design process:

The ongoing research work at Newlands is already feeding into the design and construction of the swales and lakes that will become part of Newlands Common. It is hoped that this large-scale schemes and the commitment demonstrated through this project, will provide the impetus for other developers and authorities and hopefully help towards preventing the cost and chaos of flooded homes in the future.

"Being a pioneer on a large scale SUDS system such as the Newlands project is not for the faint hearted. If the project hadn't have had the determination from all parties we would have probably ended up with a traditional drainage solution," said development director John Beresford.

"We got the full commitment from Wes

RIGHT: The Newlands Common development is situated in stunning farmland close to part of the South Downs



Woodland spine swale



Edge of the common

representatives of Grainger plc, Mayer Brown, the EA, Southern Water, Winchester City Council, Havant Borough Council and Hampshire County Council. These meetings have been used to develop acceptable drainage strategies which incorporate the ideologies of SUDS, as well as providing a forum to discuss public adoption of SUDS.

Wesley Jones, a Development Control Specialist for the Environment Agency describes the value of the research aspects of the project:

"The Newlands Common development is a flagship project for the Environment Agency," says Jones. "We have worked closely over the past five years with major stakeholders to ensure that the SUDS design was one that could be used as a blueprint for future development areas.

"Major obstacles for the inclusion of the SUDS scheme had to be overcome, which centred around the SUDS design criteria and maintenance issues. "These were all worked out in a steering group. We are sure that this success can be transferred to other development areas not only in the South but the rest of the UK. Indeed, we have presented the results of this partnership approach at national and international drainage conferences.

"The project is being carried out jointly with the Environment Agency, Developers Grainger plc, design consultants Mayer Brown and Portsmouth University. It is unique in the fact that we have collected

baseline data for the catchment over the past four years. Therefore we are in a very special position to analyse what effects the development will have on the catchment hydrology, water quality and biodiversity.

"The project will show how SUDS mitigate against the effects of urbanisation. This project will highlight how SUDS can reduce flood risk, protect waterways against diffuse pollution and enhance the environment for wildlife."

Although the Research Associate is employed by Portsmouth University, he is based at Mayer Brown's head office in Woking to work alongside their design and construction supervision teams. The current focus, funded partly by a SEEDA Business + Award is evaluating the performance of the SUDS system during the construction of one phase of development. This will allow design and operating codes to be validated for other phases of the site and for other MDAs.

Dr John Williams of Portsmouth University explains the aims of this work: "Flood protection and maintaining water quality are some of the main issues that need to be addressed in meeting the housing targets in the South East Plan in a sustainable manner. Sustainable Drainage Systems (SUDS) offer a potential solution to these problems by dealing with the increased run-off, often generated by developments, on-site in an ecologically sensitive manner.