

MAXIMISING THE BENEFITS OF SUDS BY TAKING AN INTEGRATED APPROACH TO PLANNING

Tim Darlow¹, Morag Garden*², Tom Wild³, Kiri Walker⁴

¹ *Scottish Institute of Sustainable Technology (SISTech), Heriot-Watt University, Edinburgh, EH14 4AS*

² *Scottish Water, 55 Buckstone Terrace, EH10 6XH*

³ *Scottish & Northern Ireland Forum for Environmental Research, 11/13 Cumberland Street, Edinburgh, EH3 6RT*

⁴ *Scottish Environment Protection Agency (SEPA), Clearwater House, Heriot-Watt Research Park, Riccarton, Edinburgh, EH14 4AP*

ABSTRACT

This paper discusses how the multi-functional benefits of SUDS can be maximised by detailing the work of a unique partnership group in Scotland which has adopted an integrated approach to planning. This group comprises local planning authorities, water service provider, environmental regulators, engineering consultants and NGO's. The group has been established in response to proposals being put forward for major development and redevelopment at a site called the *South East Wedge* on the outskirts of Edinburgh, Scotland. The aim of the group is to ensure that the environmental potential of the proposed development is maximised through the integration of amenity, landscape, habitat and urban drainage. The cornerstone of the group's work is the production of the *Environmental Enhancement Action Plan for the South East Wedge*. This provides a model framework and technical guidance on how a SUDS could be integrated into the development, and has included work on the predicted Whole Life Costs of SUDS. The paper provides detail on this work, and other key parts of the *Action Plan*, as well as focussing on the formation and benefits of the partnership group.

Keywords: integrated; planning; Scotland; stakeholders; SUDS.

INTRODUCTION

In the past the design of drainage systems has largely been the domain of the engineer. Sustainable Urban Drainage Systems (SUDS) are surface water drainage facilities that are designed to address three essential issues: quality of surface water runoff, quantity of runoff, and amenity (including biodiversity). These three key considerations for a holistic approach to urban runoff should be given equal weighting, and are neatly embodied by The Sustainable Urban Drainage Triangle concept (D'Arcy, 1998). If SUDS are to achieve this 'multi-functionality', their design will require the input of a number of disciplines including landscape architects, engineers and ecologists. Where the proposed site is part of a larger development, or is intended to link with surrounding urban areas, spatial planning issues also become increasingly important since amenity and wildlife benefits should be maximised (e.g. how can 'green corridors' and footpaths be used to link SUDS features such as ponds & wetlands?)

At the local level, the multiple objectives and potential benefits of SUDS make them of interest to several stakeholders. This is reflected in guidance such as the CIRIA SUDS Design Manual (CIRIA, 2000) and PAN61 (Scottish Executive, 2001), which recommend that all SUDS stakeholders should come together at the earliest possible opportunity to discuss each others' requirements for a particular development. The process of discussion and agreement is often carried out on a case-by-case basis, normally with fairly small developments being the subject of debate.

The result is that drainage design is not only is not only **multidisciplinary** but is also **cross-sectoral** involving a number of private and public bodies. For example, in Scotland the follow organisations (to varying degrees) will have an influence on design of SUDS.

- **Developers:** Commission the engineers, environmental consultants and masterplanners who will be responsible for selecting designing and siting of SUDS. They will also provide capital funding for construction of the system.
- **Local Authorities:** In Scotland, local authorities have responsibility for strategic planning, development control, building control, roads and flood control.
- **Scottish Environmental Protection Agency (SEPA):** The public body responsible for environmental protection in Scotland. SEPA, in defined circumstances, are statutory consultees to the planning process and, along with road and water authorities are responsible for giving approval to the design and technical content of the proposed surface water drainage proposals.
- **Scottish Natural Heritage (SNH):** The public body responsible for conservation and enhancement of natural heritage in Scotland. They are statutory consultees for development plans.
- **Scottish Water:** The statutory water and wastewater services provider for Scotland. They will issue technical approval of proposed drainage infrastructure to serve a development.
- **Other stakeholders:** Interested parties might include wildlife trusts and charities such as the RSPB; community groups that could undertake care and maintenance activities; local schools and universities who could use features such as ponds as educational facilities.

At the national level, requirements for (and of) SUDS are negotiated by the Sustainable Urban Drainage Scottish Working Party (SUDSWP). This self-styled 'cross organisational steering group to address urban drainage' has members which

include: Scottish Water; SEPA; representatives of Local Authorities; Scottish Executive and representatives of the development industry (amongst others). However, few cases are known to exist in Scotland where SUDS are discussed and stakeholders' requirements agreed at a regional level. Notable exceptions include the SUDS group convened by Dundee City Council, and the DEX site (see McKissock *et al.*, 2001). Another exception is the Edinburgh South East Wedge Project Group, which is the subject of this paper.

A lack of coordination at the regional level can represent a significant problem for SUDS. Perhaps the most fundamental of SUDS concepts is the Surface Water Treatment Train (CIRIA, 2000). A recent survey of SUDS in Scotland (Wild *et al.*, 2002) established that by the end of 2001, application of the 'treatment train' approach (source, site, and regional controls) had not yet become commonplace, even though SUDS were numerous (767 sites and 3913 systems). In certain cases, the implementation of an effective surface water treatment train will require regional facilities that cannot be delivered on an individual site. Protecting and improving the environment using SUDS techniques could therefore require that development proposals are considered together in a strategic manner, rather than on a piecemeal basis. This requirement for a strategic (preferably catchment-based) approach applies equally to pollution, flooding and biodiversity issues. In practice, this entails handling amenity, landscape, habitat and urban drainage in an integrated manner.

METHOD

The 'South East Wedge'

A major development and redevelopment area has been proposed to the south east of Edinburgh, Scotland. The development area forms a 'green wedge' into the city and is hence referred to as the South East Wedge (Figure 1). The site covers an area of some 1,400 hectares and comprises greenfield land, brownfield land including a former colliery site, and a number of existing communities. At present proposals for the site are:

- The creation of a new community comprising of around 3,500 houses, two new schools and a town centre.
- Extensions to the existing community of Danderhall of around 500 houses.
- Redevelopment of areas on the edge of Edinburgh to include construction of around 1000 houses.
- Allocation of 22 hectares of land for business and industrial uses.
- Promotion of industrial development on the site of the former Monktonhall Colliery.
- Allocation of 23 hectares to a biomedical research park close the new Edinburgh Royal Infirmary.

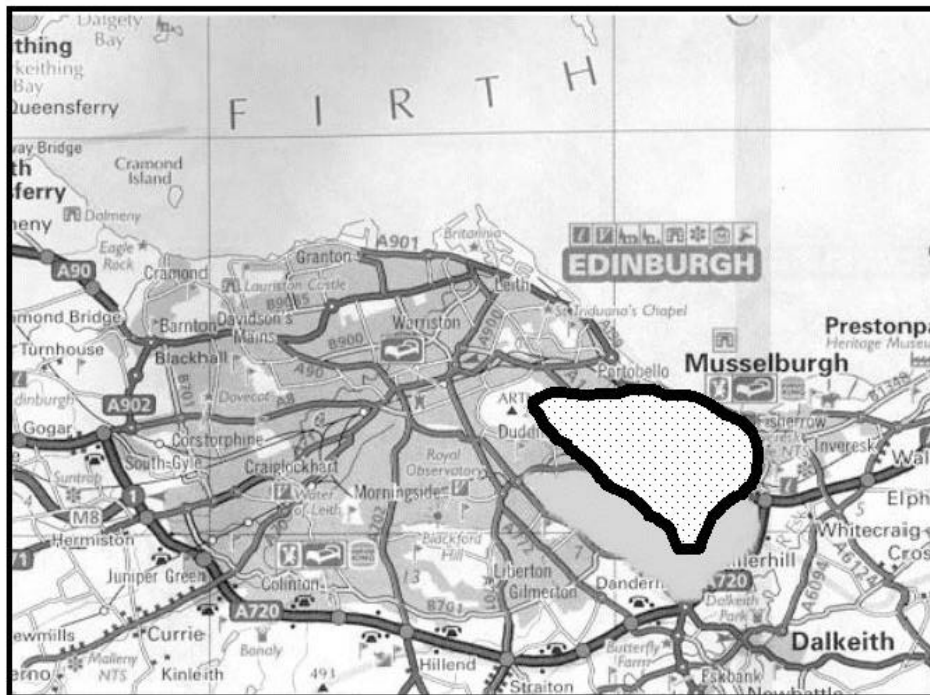


Figure 1 – The South East Wedge Development

The development area straddles two planning authority areas – Edinburgh and Midlothian – with the majority of greenfield development been undertaken in Midlothian. Current planning guidance issued by the councils set out the requirements for developers to use SUDS. A joint venture partnership between the two local authorities and a private developer has been established to take the development forward.

Drainage in the South East Wedge falls into three principal catchments: the Niddrie Burn; the 'Boundary Burn'; and the Cairnie Burn. These are all relatively small watercourses already impacted by urban runoff, combined sewer overflows and other discharges such as the pumped minewater from the former Monktonhall Colliery. In addition, these burns have been subject to historical culverting and channelisation. As a result they provide little in the way of natural habitat and amenity

value and in many cases the culverting has increased the risk of flooding. The area around the Niddrie Burn has been classified by City of Edinburgh Council as a Area of Importance for Flood Control. As a result development will only be allowed to take place in this area if measures are put forward to reduce the risk of flooding in the catchment.

To date, there are relatively few examples of the use of SUDS in large developments in the UK. Fortunately, for Scottish practitioners, the existing largest showcase in the use of SUDS lies about 30 miles north of Edinburgh at the Duloch Park / Dunfermline East Expansion (DEX) site near Dunfermline. The DEX site is of a comparable size, in terms of the amount of construction, to the South East Wedge. The SUDS at DEX make use of a hierarchy of features (the Surface Water Treatment Train approach, CIRIA 2000) which rely on treatment ponds as the regional treatment component. At the time of design of the system, SUDS was still very much a developing concept in the UK, and no UK design guidance was available. As a result, some opportunities for maximising potential amenity and wildlife benefits were missed, in particular: the integration of SUDS with nature conservation in the associated streams; culverting of local watercourses; and ecologically sympathetic design of features such as ponds (McKissock *et al.*, 2001).

The South East Wedge Project Group

All those organisations involved in planning of the South East Wedge development were keen to ensure that the approach to management of surface water in the development moved on from DEX, especially in terms of maximising the potential amenity and wildlife benefits of SUDS and associated watercourses. As a result, a unique Project Group formed in late 2000 comprising of: Midlothian Council; City of Edinburgh Council; SEPA; and SNH. The Scottish Institute of Sustainable Technology (SISTech), a not-for-profit research and development organisation, were and are responsible for project management.

The group sought a holistic approach to the management of surface water. This is encompassed in three principal aims:

- Ensuring that every opportunity is taken to integrate SUDS into the South East Wedge Development. This should make maximum use of the ‘Surface Water Treatment Train’ approach to urban drainage (which is based upon 4 key drainage techniques: (1) good housekeeping; (2) source control; (3) site controls; (4) regional controls).
- Facilitating the rehabilitation of existing watercourses through the removal of concrete culverts and channels and to ensure there is no further culverting in the development area. This should reduce the risk of flooding as well as providing natural habitat and amenity.
- To maximise the ecological, landscape and amenity benefits of the new watercourses and SUDS features. These features need to be designed as an integral part of the South East Wedge landscape and environmental strategy.

The partnership approach taken by the organisations on the group is unique and has many benefits. The project group is multidisciplinary and cross-sectoral and promotes an integrated approach to planning. Bringing this diverse group together allows the members to gain a greater understanding of each others different statutory remits and aspirations with regards to SUDS. For instance, SNH are principle concerned with the landscape and natural environment aspects of SUDS, whereas Scottish Water’s first concern is with their engineering performance.

On behalf of SEPA, a project was recently undertaken by Hyder Consulting to evaluate the guidance available in Scotland on SUDS (Wild *et al.*, 2003). One of the conclusions this study was that there is a need to address inconsistencies in advice provided by different stakeholders. The formation of the Project Group aims to go some way to addressing this issue. The study also concluded that UK design guidance on SUDS needs updating to:

1. Include information on Scottish case studies,
2. Specify types of SUDS that are acceptable in different scenarios.
3. Include more details on the ecological aspects of SUDS (e.g. habitat enhancement).

In line with the conclusions of the Hyder report, the group felt that existing design guidance for SUDS did not provide enough detail on their use to enhance the environment- in terms of landscape, amenity and natural heritage. The linking of SUDS with watercourse rehabilitation aspirations is also unique in UK in the context of large developments.

Therefore, the project group felt the situation warranted the production of design and technical guidance specifically for the South East Wedge. An initial scoping exercise was carried with employees of the principle stakeholders in the development to assist in developing a brief for the guidance. One important conclusion of this exercise was the need for more information on the maintenance requirements of SUDS.

RESULTS & DISCUSSIONS

The Environmental Enhancement Action Plan

The resulting guidance document - entitled *The Environmental Enhancement Action Plan* - has been produced by SISTech with input from engineering and environmental consultants WA Fairhurst & Partners. The Action Plan is intended to provide bespoke guidance on SUDS and watercourse rehabilitation which will be of use throughout future stages of development implementation: development masterplan; outline planning permission; detailed planning permission; and implementation. The report has been distributed widely to stakeholders in the development including: developers, planners, engineers, architects and community groups.

The Action Plan provides details in the following areas.

SUDS Design

The report sets out the framework for design of SUDS around the 'surface water treatment train approach'. At the time of production of the Action Plan, the planning of the development was in its early stages. Therefore, it was only feasible to consider the sizing and siting of SUDS **Regional Features** such as ponds and wetlands. Substantial detail has been provided in the Action Plan on how the ecological and amenity benefits of ponds can be maximised through consideration of their physical form, planting and public access considerations. Regional facilities should be integrated with other green spaces and surrounding development to become a focal point for communities. A 'toolbox' of indicative designs for **Source** and **Site** controls, and examples showing how these could be utilised within the development are also included. Designs also show how the **Strategic Conveyance System** between different stages of the treatment train could link with the provision of multi-user green corridors (see below). The incorporation of safety considerations has formed a core of all the proposals presented.

Rehabilitation of Watercourses

The 'daylighting' of watercourses in the South East Wedge is seen as having a number of significant benefits for both existing and future communities.

- Potential to **mitigate flooding problems** through the removal of troublesome culvert entrances and the provision of additional channel capacity.
- The provision of a **highly visual community asset** with significant environmental awareness raising and educational opportunities.
- A focus for **regeneration** of existing urban areas.
- **Natural habitat** enhancement and creation.
- With careful consideration to the **access** and **footpath links** the watercourse corridors could serve to connect new communities with the existing urban areas and public open space.

Preliminary designs have been produced for rehabilitation of the watercourses in the development that will serve as a platform for more detailed design work in the future. These designs show the proposed path for the burns, channel cross sections, allowance for public access and links with the developments strategic path network.

Integration within the Development

SUDS and their associated watercourses should not become isolated 'green islands' within a development: their environmental value will be greatly enhanced if consideration is given to the linkages between them. The Action Plan makes use of 'multi-user green corridors' as a central design theme. The SUDS will consist of interlinked, and predominantly above ground, features. This provides an ideal opportunity to create a network of green passageways for wildlife, walkers and cyclists as well as routes for drainage features. The Action Plan presents an overall plan of how major SUDS features will link with watercourses, development area, greenspace and a strategic path network.

Management and Maintenance

SISTech carried out research into the maintenance and management of SUDS features. In response to concerns raised during the initial scoping exercise this study had two goals:

- Production of typical schedules of maintenance for a range of SUDS features.
- A whole-life cost comparison of SUDS and conventional piped system.

Information on SUDS maintenance schedules was compiled from a wide range of sources as possible so as to represent 'best practice'.

- Existing UK experience.
- Experience of maintenance in the USA. The use of SUDS has been promoted in America since the early 1980s and a greater understanding of longer-term performance and management has been developed.
- Liaison and discussion with professionals currently responsible for design and management of SUDS features in the UK including local authorities, landscape and engineering consultants and contractors, and manufacturers of propriety SUDS features such as 'porous' paving blocks.

These schedules not only consider ensuring the on-going engineering performance of the feature, but also their role in the provision of amenity and natural habitat. Intensive management of SUDS features and their associated greenspace - in particular high frequency of grass cutting and continuous and liberal application of herbicides and pesticides - will reduce their conservation value. The use of non-native plants should be avoided, as they will often require increased quantities of fertiliser. Avoiding the use of planting on bare soil will increase biodiversity and decrease runoff of soil and fertilisers.

A proposed major development near Dundee was used as a case study for the whole-life costing exercise. Construction costs were calculated for both a SUDS and conventional piped system at the site. Maintenance and replacement costs were

then predicted over a long period of time (100 years+) for both systems. Standard methods of discounting were used to calculate the present value for all the costs. This analysis showed the whole life cost of the SUDS option to be no more expensive than those for the conventional system. This of course does not take into account the benefits SUDS provide in terms of environmental enhancement and protection.

ENVIRONMENTAL PLANNING AND SUDS

Certain SUDS stakeholders have a statutory remit to plan, consult upon and implement water resources management at a national or regional level (including: SEPA - river basin management planning; Scottish Water – Quality and Standards; Local Authorities - Local Plans).

Taking the example of river basin management planning helps to elucidate some of the issues arising from such duties and their interactions with SUDS implementation. Under the Water Environment and Water Services (Scotland) Act 2003 ('the Act'), SEPA has a duty to produce river basin management plans (RBMPs). These plans must set out environmental objectives for water bodies and provide a programme of measures to be used to achieve the objectives.

RBMPs have to be published, and named stakeholders must be consulted. There is also a certain amount of anticipation that water users (i.e. 'the public' or 'local communities') will be encouraged to participate in the river basin management planning process (SPICE, 2002). However, it is not useful to conceive the community as a single entity. It should be recognised as being fragmented, and not always located in a particular place (Healey, 1997). In order to circumvent this problem, the Act requires SEPA to establish one or more advisory groups which could be expected to represent water users, or facilitate public participation, or both. The roles and remits of these advisory groups are not stated in the Act, and are yet to be determined by SEPA.

SUDS may well be included within RBMPs under the programme of measures (both as urban drainage schemes for new developments, and as 'retrofit' solutions for existing diffuse pollution problems). In other words, particular SUDS could become the subject of consultation and local public debate, with different stakeholders from various professional and social backgrounds seeking different outcomes. This is not only morally defensible on the grounds of democratic rights, but also has a functional purpose: Brown and Ryan (2001) have highlighted that source control (a concept integral to SUDS) is not a single discipline of expertise. Sustainable urban drainage is more than just a technological concept concerned with the engineering of such structures as swales and retention ponds – it also involves the behaviour of people (e.g. in preventing pollution). Sustainable urban drainage has to address the relationship between society and the physical environment.

Decisions about SUDS will always be made on a consensual basis by groups of people because sustainable urban drainage is by definition a transdisciplinary concept. In order to achieve this consensus, stakeholders need to develop a common language and understanding of the issues, which usually requires regular communication, preferably by meeting face-to-face. Certain tools have been developed to help resolve these issues, including collaborative or participative planning processes (Healey, 1997). Moreover, the use of diagrams and 'lines on maps' can help to convey otherwise complex issues. It is no coincidence that RBMPs must contain or be accompanied by such maps, diagrams, illustrations and descriptive matter as the Scottish Ministers may direct' (Water Environment and Water Services (Scotland) Act 2003).

Over the last few years, the South East Wedge Project Group have found that working together to agree an approach to sustainable urban drainage is not easy, and nor is it quick. However, by meeting regularly to discuss proposals, recording relevant decisions and preparing its Environmental Enhancement Action Plan, the group has hopefully produced outcomes that are meaningful, and which go far beyond a laudable yet vague commitment to 'implement SUDS'. The maps and conceptual drawings of proposed schemes that form a major part of this plan should in theory be understandable by all stakeholders. If the public are going to be able to participate in environmental planning, those who oversee the process must ensure that everyone can relate to the plans.

CONCLUSIONS

- The benefits of SUDS – in terms of water quality, water quantity, and amenity & natural habitat- are most effectively promoted though an integrated approach to planning.
- An holistic approach to the management of surface water which includes SUDS and their associated watercourses can provide significant environmental gains.
- To facilitate this in a major development in Scotland a unique Project Group of stakeholders has been established. A partnership of this kind has a number of significant advantages- not least in delivering an integrated approach to planning.

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