SuDS – PRINCIPLES AND DRIVERS

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Abstract

The seven local authorities in the Dublin Region have recently introduced new policies regarding drainage. These policies were produced under the Greater Dublin Strategic Drainage Study (GDSDS) and they are also being applied outside the original study area. The policies include a commitment to the use of SuDS (Sustainable Drainage Systems) which are now required on all new developments both public and private. SuDS are a method of reducing or preventing excess stormwater runoff by mimicking natural hydrological behaviour. This brings benefits in terms of stormwater control, prevention of flooding, removal of pollutants and sometimes, the provision of amenity areas. The idea of SuDS is to prevent development from interfering with the natural hydrological cycle and this should benefit ground waters. While new techniques are always met with scepticism, the advent of SuDS will bring enormous benefits to all of our waters and the communities that depend on them.

SUSTAINABLE DRAINAGE SYSTEMS (SuDS)

Definition of SuDS

To understand SuDS we must first consider the natural hydrological behaviour of a greenfield site. When rain falls on such a site, it normally soaks into the soil. Only where there is particularly heavy rainfall will some of it run off slowly over the ground surface to the nearest ditch or watercourse. Most pollutants are filtered through soils or broken down by bacteria.

When these greenfield sites are built on, much of the area becomes impermeable. With no soakage available, runoff is piped to the nearest watercourse or storm drain. Thus both the volume and rate of runoff can dramatically increase. In built up urban areas this runoff ends up in urban streams or existing pipes that were never designed for these loads. This may lead to flooding or increased overflows from combined sewers, neither of which is acceptable. A combined sewer is where foul and surface water flows are transported in the same pipe. Excess runoff also causes problems with increased surcharging of pipes. This causes pipe damage and maintenance problems and may lead to foul sewage escaping from the pipe into the groundwater. Excess flows in combined systems can also lead to increased costs for wastewater treatment. The potential to naturally remove pollutants is lost. SuDS are defined as “a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques”. Using SuDS techniques, water is either infiltrated or conveyed more slowly to watercourses via ponds, swales or other installations. The use of SuDS closely mimics natural catchment behaviour and results in attenuation of stormwater runoff and improved environmental performance. SuDS systems vary from infiltration trenches/soakways, filter drains and permeable pavements to swales, detention basins and stormwater wetlands.

Stormwater Control

Stormwater attenuation has been a requirement in Dublin City since 1998 when Dublin City Council introduced it’s Stormwater Management Policy. This limited runoff from developed

sites to pre-development rates with excess runoff being stored on site. The emphasis of this policy was on achieving stormwater attenuation with little regard given to tackling the water quality issues with surface water runoff. In most cases, developers met their obligations by installing Hydrobrakes or similar flow control devices to control runoff and underground concrete tanks to store excess water. This led to problems with maintenance, with cleaning of underground tanks being a particular health and safety issue. Building these tanks also had cost implications for developers who began looking at alternatives to underground tanks. Surface ponds were already being included in some developments for aesthetic or fire fighting reasons but the potential of these to provide stormwater control or environmental improvements was rarely exploited. SuDS devices offer alternative solutions while providing significant environmental benefits.

Environmental Issues

Public interest in the quality of our surface water has never been higher and this is now being reflected in increasing political interest. There are significant problems to be addressed. The Environmental Protection Agency (EPA) Water Quality Classification for the Dublin region shows extensive pollution with a high percentage of waters in the Eastern River Basin District at risk of not reaching "good status" by 2015. This is a requirement of the EU's Water Framework Directive so there is now significant pressure on local authorities to improve water quality.

Stormwater runoff from urban areas impacts on surface water quality. Firstly, storm runoff can carry pollutants such as oil, anti-freeze, animal and human waste, decaying leaves, grass or other waste matter to our surface waters. This is particularly critical in the case of the first flush, where material may have decayed for several weeks in dry weather before being washed into the watercourse. This is particularly serious when the baseflow in the watercourse is low, which would also be consistent with a long dry period. Secondly, surface water in older areas frequently drains into combined sewers. These were designed to carry dry weather flow and smaller storm events but to overflow to watercourses during more severe storms. In practice, many combined sewers now drain considerably greater areas than they were originally designed for and this extra load means that they can overflow in relatively minor rainfall events. The overflow of, admittedly dilute, foul sewage to a watercourse has obvious pollution implications.

The use of SuDS can help address both of the above issues by providing a control on stormwater volume and quality. Volume control reduces the number and severity of overflows from combined sewers. SuDS also have a direct bearing on water quality. Infiltration systems lead to pollutants being filtered out or broken down by bacteria. Swales encourage pollutants to settle out or be broken down naturally. Retention systems such as ponds also allow settlement and natural breakdown of pollutants via aquatic plants and other organisms.

Amenities

In addition to providing runoff and pollution control benefits, some SuDS can provide amenities to local communities. Ponds or wetlands can be visually attractive. They provide vital habitats for birds and other wildlife and recreational opportunities for local people. Local authorities are now obliged under the Biodiversity Convention to promote wildlife habitats and the introduction of wildlife into urban areas can only be positive.

Typical SuDS Installations

SuDS systems vary from infiltration trenches/soakways, filter drains and permeable pavements to swales, detention basins and stormwater wetlands. Other options which can also be used to assist stormwater runoff control include water-reuse, roof water collection (water butts) and rooftop gardens. Typical examples of SuDS installations and the way they operate are as follows:

Permeable Pavements	Use of porous asphalt, porous paving or similar concepts to reduce imperviousness thus minimising runoff. Runoff infiltrates to a stone reservoir where some breakdown of pollutants occurs before controlled discharge to a drain or watercourse or direct infiltration.
Filter Drains	A gravel filled trench, generally with a perforated pipe at the base which conveys runoff to a drain or watercourse. These provide attenuation and trap sediments.
Infiltration Trenches/ Soakways	Gravel or rock filled pits or trenches designed to store runoff while letting it infiltrate slowly to the ground. Provide treatment of runoff through filtration, absorption and microbial decomposition.
Bio-Retention	These devices are depressions back filled with sand and soil and planted with native vegetation. Provide filtration, settlement and some infiltration. Piped drainage provided at the base to pipe filtered runoff back to the drainage system or watercourse.
Swales	Grass lined channel designed to convey water to infiltration or a watercourse. Delays runoff and traps pollutants via infiltration for filtering effects of vegetation.
Detention Basins	Dry vegetated depressions which impound stormwater during an event and gradually release it. Mostly for volume control but some pollutant removal achieved via settlement of suspended solids and some infiltration.
Retention Ponds	Permanent water bodies which store excess water for long periods allowing particle settlement and biological treatment. Very effective for pollutant removal but limited to larger developments. Have high habitat and aesthetic benefits.
Stormwater Wetlands	Like retention ponds but with more vegetation and less open water area. Excellent for pollutant removal. Also provide aesthetic and habitat benefits.

<u>Greater Dublin Strategic Drainage Study (GDSDS)</u>

The Greater Dublin Strategic Drainage Study (GDSDS) was established in 2001 with funding from the Department of the Environment, Heritage and Local Government (DEHLG) to analyse the existing drainage system in the Greater Dublin Area and to make recommendations on future drainage policies. The study area included the functional areas of the four Dublin Local Authorities and parts of Meath, Kildare and Wicklow. The study included hydraulic modelling of foul and storm drainage networks and of eight rivers in the area. A key outcome of the study was the recommendation of future regional drainage policies for the Greater Dublin Area. This included policies on New Development, Environmental Management, Climate Change, Infiltration/ Ex-filtration and Basements. The new drainage policies arising out of the Greater Dublin Strategic Drainage Study have now been included in the Development Plans for Dublin City Council and the surrounding local authorities. The 1998 Dublin City Council Stormwater Management Policy was reviewed and updated as part of the new GDSDS Regional Policies with the use of SuDS being advocated

under both the Environmental Management and the New Development policies. The Technical Document on New Development contains the following text on Sustainable Drainage Systems:

All new developments shall incorporate SuDS facilities, unless the developer can demonstrate that SuDS is impractical due to site circumstances. Where SuDS cannot be provided, the developer shall provide alternative means of dealing with pollutants.

SuDS are now compulsory for all new development in the region. There are signs that local authorities outside the Dublin region are also implementing this policy. It would be welcomed if these policies, or something very similar, would be adopted countrywide in the near future.

Experience in Other Countries

People often express reluctance to shift to SuDS due to a lack of research or lack of understanding about their long-term behaviour. The long-term nature of engineering work means that conservatism is natural. Nobody wants to risk unforeseen problems that may have long-term implications. However SuDS have been in use worldwide for some considerable time. SuDS installations in Sweden go back 15 years and any teething problems have now been overcome there. The same has been recorded in the USA, where SuDS are also well established. There have been some problems in the past with poorly constructed ponds or wetlands but knowledge in these areas has now increased. SuDS are now firmly established in Sweden, the USA, New Zealand, Australia and the UK, and particularly Scotland, for several years. In none of these countries have SuDS been considered to be unsuccessful.

Conclusion

The use of SuDS is now compulsory in the Dublin Region and this is spreading to other parts of the country. SuDS bring enormous benefits in terms of stormwater control, prevention of flooding, removal of pollutants and provision of amenities to local communities. It is unlikely that the water quality requirements of the EU's Water Framework Directive can be met without greatly increased use of SuDS systems. SuDS will bring benefits to developers as well as to the public. Now that the need for stormwater control is accepted, these techniques can be adopted at little or no additional cost. SuDS need to be incorporated at the planning and design stage of a development rather than being included as an afterthought. SuDS offer developers more tools for meeting their stormwater control obligations in a way that can also enhance the quality of developments. Public awareness is also an important factor in ensuring the successful implementation of sustainable drainage practices.