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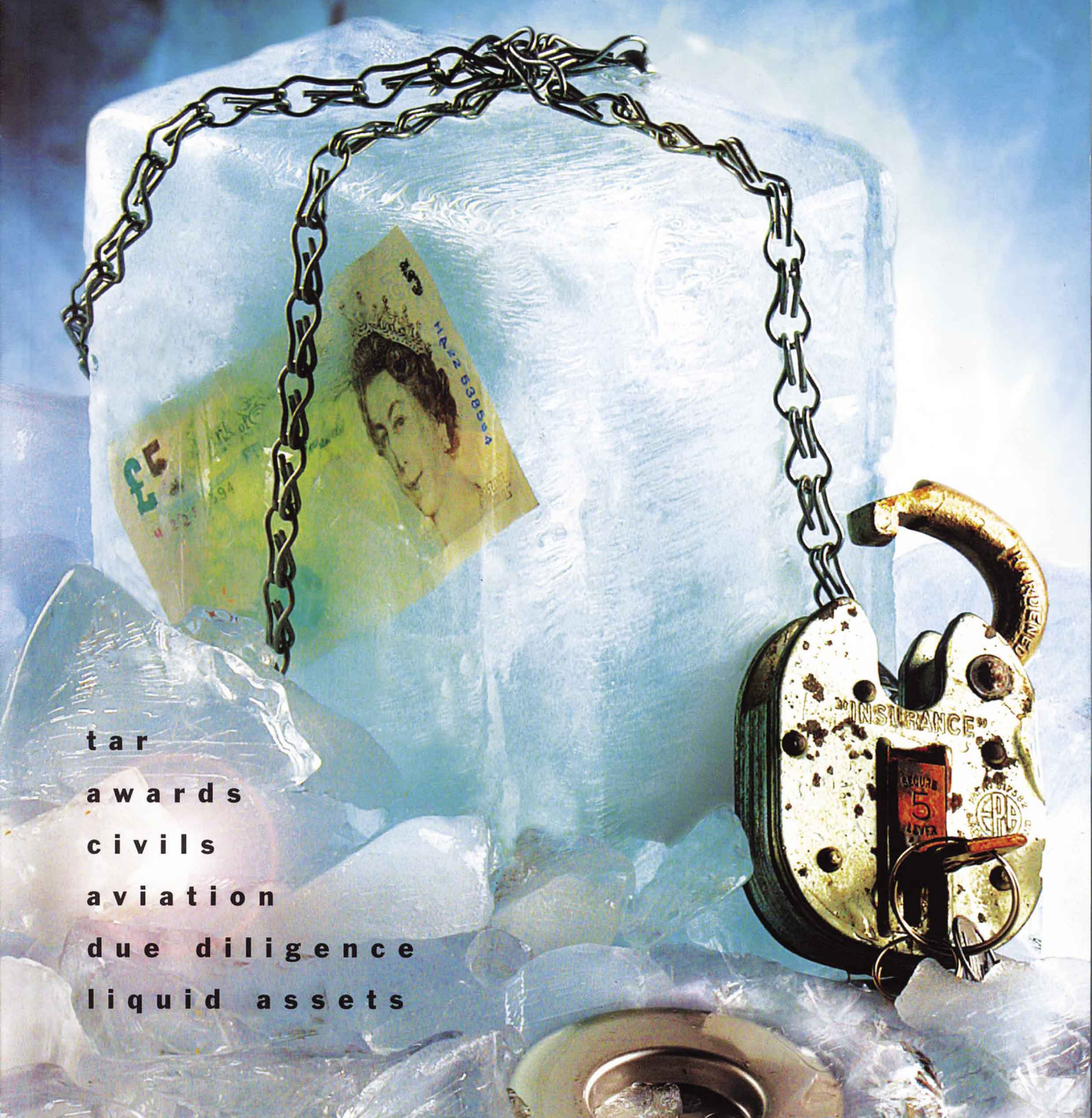
Built Environment Matters



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MANAGING LIQUID ASSETS

Over the past decade there has been a great deal of research into sustainable drainage systems, whilst methods which balance the effects of increased runoff from hard surfaces are now widely accepted. In this article, Peter Wilder, Derek Lovejoy Partnership, looks at the role of Total Catchment Planning and Integrated Water Management in managing this precious resource.

In recent years, many sustainable-drainage schemes have been implemented which employ either grass swales, retention basins or balancing ponds to reduce the effect of development on urbanised river-catchment systems. Some schemes use a combination of attenuation, filtration and infiltration devices in order to maximise groundwater recharge as well as ensuring that the quality and quantity of site runoff emulates that of the site prior to development.

TOTAL CATCHMENT PLANNING

The influence of planning policy has seen the emphasis of sustainable drainage shift from that of source control of runoff, to one of Total Catchment Planning. This is backed up by the introduction of the EU Water Framework Directive (WFD), which was introduced in December 2000. The WFD requires all inland and coastal waters to reach 'good status' by 2015. It will establish a river-basin district structure within which demanding environmental objectives will be set, including ecological targets for surface waters. The first objective of the WFD states that 'Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such.' The Directive identifies water as a community resource that transcends the boundaries of nations and must be protected on a total catchment basis, which may extend outside of the territories of the EU. This is the first piece of legislation to recognise the principles of Total Catchment Planning and to implement policies for the protection of

Pictured is the main balancing pond at Dalton Park which can attenuate 4000cu m of rainwater during peak flows which it then slowly releases back into a nearby stream. (image courtesy Lovejoy)

watercourses that not only flow through but originate or terminate outside of the jurisdiction of member states.

Total Catchment Planning relies on an understanding and control of surface-water runoff within a site's boundary, and an understanding of the pressures on the receiving watercourses offsite. This applies not just to urban sites, but also to rural sites where the surrounding sites may be sensitive to the effects of development or changes in hydrological characteristics. At Lovejoy we have developed an approach that we call Zero Hydrological Impact design. ZHI assesses the potential for existing or new pollutants to become mobile on site and the level of filtration and attenuation required on site to prevent escape. It also ensures that increases in hard surfaces are balanced by on-site attenuation to ensure that discharge from the site remains consistent with the coefficiency of a greenfield site.

In a recent scheme in County Durham, 600,000sq m of colliery shale was moved to create the development footprint for a retail outlet. A stream that ran beneath the site had to be protected from increased site runoff, and from migration of nitrates and phosphates into the watercourse, since sewage sludge was used to transform the inert shale into a growing medium. Using digital terrain-modelling software we were able to determine cut-and-fill quantities for the site that gave us gradients of less than 1:3, as well as being able to determine the watershed characteristics of the new landform. We were able to determine where slope stabilisation would be required, and the direction and velocity of site runoff. A series of lakes and ponds were used both to attenuate and filter runoff from the newly created landform, while filter-planting zones act as sediment traps for runoff on the steeper slopes of the parkland setting. In all, over seven different habitat zones were created from material that was once considered waste.

BELOW-GROUND SOLUTIONS

Sometimes our work involves planning for developments within river floodplains. Although buildings are often protected from flood damage by being constructed on raised plateaus or piers, the river is often not protected from oil or pollutants associated with car parking in areas below the flood level. We have recently devised strategies that ensure that the first flush of runoff from sites subject to flooding is directed into water-storage cisterns below ground.

Although silt traps are effective in removing suspended solids from rainwater runoff, once breached by floods, petrol and oil interceptors often release their captive pollutants into the watercourse. By collecting site runoff in underground cisterns, pollutants can be slowly released through stormwater wetlands for treatment when floodwaters have abated. Petrol and oil can be stored in sealed compartments that shut off when floodwaters rise, to be pumped out from their underground storage at intervals. This proposal has enable developments, such as Skew Bridge in Rushden, to gain planning permission even when they exist close to sensitive landscapes such as a neighbouring SSSI.

RAINWATER – A PRECIOUS RESOURCE

In the city, advances in roofdeck technology combined with a sustainable approach have seen the development of schemes which re-use rainwater for irrigation, toilet flushing and ornamental water features. The Debis building on Potsdamer Platz is a superb example of water management on confined urban sites (see case study overleaf). The scheme by Atelier Dreiseitl in Germany is one of many schemes by the practice that see rainwater not only as a precious resource, but also as an element that should be expressed and allowed to play through the public realm.

INTEGRATED WATER MANAGEMENT

Recently when we looked at the Lower Lea Valley as part of London's bid for the 2012 Olympics, we began to address the issue of catchment-wide planning for urban development. Sandwiched between the boroughs of Newham and Tower Hamlets the 660ha site lies in an area of industrial decline set to become the focus of urban regeneration in London. A series of new development nodes along the Lea Valley would integrate the communities either side of them whilst forming a green corridor of metropolitan land running either side of the Lea River. The function of this open land would not only be to provide amenity and connectivity for the surrounding communities, but to provide flood buffer zones.

The Lower Lea Valley is liable to flooding from both fluvial and tidal surges, with the incidence of both occurring more frequently over recent years. Traditionally, the area has relied on flood-defence walls to provide a barrier against rising water levels. This has the effect of driving the flood waters on until the tidal and fluvial surges meet, often breaching the flood defences. In order to break this cycle a new approach was necessary in order to absorb the impact of flood surges and repatriate the surrounding landscape with its river. In certain areas the flood-defence walls would be removed to create flood buffer zones within former industrial areas. Expansion zones along the riverfront would allow the re-establishment of a riparian corridor that would accommodate the daily ebb and flow of the tidal Lea River. Behind these, flood-alleviation zones would allow the swollen river to expand into the landscape and absorb the shock wave of stormwater surges and tidal surges during peak-flooding events. Stormwater wetlands, located above the maximum flood levels, would act as attenuation facilities for rainwater runoff from developed areas, and slowly release the rainwater once high water levels had receded. Between the stormwater wetlands and new urban villages would lay a series of meadows and swales, acting as a filtration zone for rainwater runoff, and as an improved wildlife habitat within the landscape corridor.

THE IMPORTANCE OF SPACE AND TIME

It is ironic that the Lower Lea Valley should be the location of Joseph Bazalgette's famous interceptory sewer system, the device which sealed the fate of so many of London's streams, and turned them into underground systems to remove the stench of raw sewage that once plagued the city. Although we still rely on modern sewage removal and treatment systems we have come to understand the importance of space and time. Water needs space to move if we are to live with it, and time to restore itself when it is used to carry away the pollutants that we subject it to. History has taught us that if we take any shortcuts in our treatment of water, the problem is only compounded elsewhere.

The Lower Lea Valley will become an area of major urban regeneration, regardless of whether London's bid for the 2012 Olympics is successful. Part of the Farrell/Lovejoy proposals for the site included the removal of some flood-defence walls which would allow the river to expand into flood-alleviation buffer zones. These areas along the riparian corridor would also accommodate stormwater wetlands to attenuate runoff. (Image courtesy Lovejoy)

Peter Wilder is an Associate with Lovejoy London and is currently working with Hines Irrigation to develop innovative irrigation solutions for sustainable water-management strategies. He will be speaking at the 24th Annual Irrigation Show in San Diego, California, with Sharon Hines on the theme of Water Resource Management.