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BUILT ENVIRONMENT MATTERS

Water smart

Throwing a lifeline to our cities

RETAIL
REGENERATION
SUSTAINABLE FM
LANDSCAPE DESIGN

STORM FORCE

Fitzgibbon Chase (photo courtesy Economic Development Queensland)

No longer to be disposed of as quickly as possible, stormwater is now recognised as a valuable resource for water supplies, communities and the environment. Here, Chris Tanner, founding Director, Bligh Tanner, examines how cities are successfully engaging with stormwater…

Cities have evolved. One of the first great transformations was the installation of sewer systems resulting in a leap forward for public health. This was followed by reticulated water supplies and stormwater drainage systems. The 'drained' city occupied the last century; it was an era when stormwater was supposed to be out of sight and out of mind, so as engineers, we developed systems to dispose of it as quickly as possible using underground piped networks. This century is seeing a shift to engage with stormwater, because it is now recognised to be a valuable resource for water supplies, communities and the environment.

This article presents three case studies, illustrating how this is occurring. The first is about the community, explored through work completed by Bligh Tanner in collaboration with Place Planning Design and Water by Design, and investigates the multiple uses of public open space. The second is about the environment; examined through a special educational needs school completed by Bligh Tanner including a novel approach to managing stormwater so as to mitigate environmental impacts. The third is about using stormwater as a water-supply resource through the harvesting of rainwater and stormwater for a new residential estate.

Fitzgibbon Chase PotaRoo (image courtesy Bligh Tanner)

Multiple Use Public Open Space

Water Sensitive Urban Design (WSUD) is the preferred approach for mitigating the impacts of urbanisation on the natural water cycle and is used to reconnect communities with the landscape and management of local water. Physically integrating WSUD elements into the surrounding landscape usually requires space, competing with other demands such as additional housing lots, roads, pathways, service corridors, environmental reserves, open space and flood management.

This investigation explores the issues and opportunities associated with integrating WSUD into multiple-use open spaces. Traditional stormwater management infrastructure is seen to compromise the functions of public open space as it focuses on the rapid conveyance of water with little consideration for amenity. WSUD, on the other hand, has a number of common objectives such as improved amenity and connectivity through high-quality water infrastructure, improved ecology and environmental protection and enhancement.

Figure 1 Open Space Types

The investigation presents a proposed framework that includes design standards for different types of open space based on research, case studies, and stakeholder consultation. Broadly, the framework identifies that areas used for both WSUD and public open space must:

- **Be fit for any intended active recreation in terms of size, slope and surface;**
- **Be sufficiently safe – timing, depth and velocity of any inundation;**
- **Rapidly recover from inundation, particularly for playing surfaces;**
- **Be designed to be attractive and allow for social interaction and interpretation when appropriate;**
- **Protect existing conservation features and values.**

Types of open space (illustrated in Figure 1 above) include active (sporting fields, playgrounds, picnic and barbeque shelters), passive (gardens, informal lawn areas and walking and cycling tracks), conservation (natural and largely unmodified bushland areas), and operational (land under power line easements, buffers to adjacent land uses, constructed drainage lines such as concrete-lined channels).

The framework requires an investment of time and money from government to achieve better-integrated processes. In addition, developers must establish collaborative and thoughtful design teams and invest in good design practices. This will ensure designs are worthy of consideration for inclusion in open space or alternatively as an offset to the provision of open space (a normal requirement of development).

The framework presented shows that public open space is not necessarily compromised by incorporating WSUD and that it can actually be enhanced. Similarly, using public open space for WSUD infrastructure also provides incentives to promote higher standards of WSUD.

The FiSH and PotaRoo

Economic Development Queensland (EDQ) is the Queensland Government vehicle for the delivery of sustainable affordable housing. At their Fitzgibbon Chase site, they have implemented stormwater- and roofwater-harvesting schemes for non-potable reuse (the FiSH) and potable reuse (the PotaRoo) that will achieve approximately 50% savings on normal mains water use. This is being executed along with the delivery of approximately 1000 homes.

The FiSH project will divert urban stormwater runoff from the drain running through the UDA, pump it to a large raw-water storage unit, then treat it by filtration and disinfection prior to distribution via a third pipe dual-reticulation system. The project will supply non-potable water for irrigation, toilet flushing, cold water to laundries and outdoor uses throughout Fitzgibbon Chase. A schematic plan layout is shown in Figure 2 below.

Figure 2 The FiSH Schematic Layout Plan

The FiSH yields approximately 89 megalitres (Ml) per annum or about 63% of the total non-potable water demand for the housing estate. Apart from water supply, the FiSH scheme offers significant environmental and economic benefits. Water harvested from the drain has entrained pollutants in the water and by removing this water from the normal runoff, it also removes the pollutants. Analysis shows that the amount of pollutants removed is of a similar magnitude to the target urban stormwater pollutant reduction objectives that would normally require the construction of bio-retention filtration devices, wetlands or similar. This results in considerable money savings for the developer.

The PotaRoo project will harvest roofwater from approximately five hectares of roof catchment (or 600 homes). Roofwater will be collected in a number of communal tanks located throughout the Fitzgibbon estate and then pumped to a central storage and water-treatment plant. The water will undergo a high level of treatment to achieve water of potable quality and be monitored to ensure that it meets the relevant water-quality requirements. The PotaRoo yields approximately 40Ml/annum or about 50% of the total potable water demand for the housing estate. This is shown in Figure 3 above.

Considered together, these two projects demonstrate that stormwater and rainwater harvesting are feasible, providing a cogent alternative to traditional water supplies, typically sourced from large dams, reservoirs and pumping systems.

Figure 3 The PotaRoo Schematic Layout Plan

The Noosa Flexi-Learning Centre

The Noosa Flexi-Learning Centre aims to create a welcoming and distinctly non-institutional learning environment for disenfranchised youth in Noosa, Queensland. The design response is to create a beach-house style environment that minimises its impact on the site, as well as on the planet's resources.

The young people that will use the centre are facing life with very few privileges. By creating a learning environment that embodies exemplary sustainability features, the design team hoped to provide accelerated opportunities for young people to understand and interact with aspects of the environment that are important to the world in which they inhabit. Such learning opportunities can help build their pride, self-confidence and sense of purpose.

The stormwater management strategy helps create such a place by:

- **Preserving the natural hydrology across most of the site by building lightweight structures on piers, and minimising soil compaction during construction;**
- **Harvesting rainwater and using a prominent elevated rainwater tank that both symbolises the responsible use of water and reduces the electricity needed for pumping.**

The overall intent of the stormwater strategy is to mimic the natural hydrology of the site by minimising the level of disturbance to the existing ground conditions. Key features of the strategy include:

- **Maintaining ground-level permeability across 90% of the site;**
- **Developing approximately 1/3 of the site with buildings predominantly constructed on raised piers (consistent with a Noosa beach-house feel) to largely preserve ground-level infiltration characteristics and preserve large areas of vegetation and shallow tree roots;**
- **A small carpark made of permeable pavement to reduce runoff from small rainfall events;**
- **Roofwater runoff captured in rainwater tanks and tank overflow diverted to infiltration trenches;**
- **Overland flow paths which are similar to existing conditions.**
- **Under major storm events, water will flow across the south-western boundary of the site towards a nearby creek. The small increase in impervious areas means there is only a small increase in peak flows under major storm conditions which is easily mitigated.**

The strategy is shown on the schematic layout plan in Figure 4 below.

The strategy is simple and feasible, and is closely linked to the architectural design of the site. It meets/exceeds all regulatory and environmental requirements and creates a positive place for disenfranchised young people.

Conclusion

The three case studies that have been explored in this article provide at least part of a blueprint, demonstrating the potential of stormwater to overcome water shortages and improve environmental and community outcomes. Engaging with stormwater provides a valuable opportunity to embrace the concept of a Water Sensitive City, ultimately improving the liveability of our urban places.

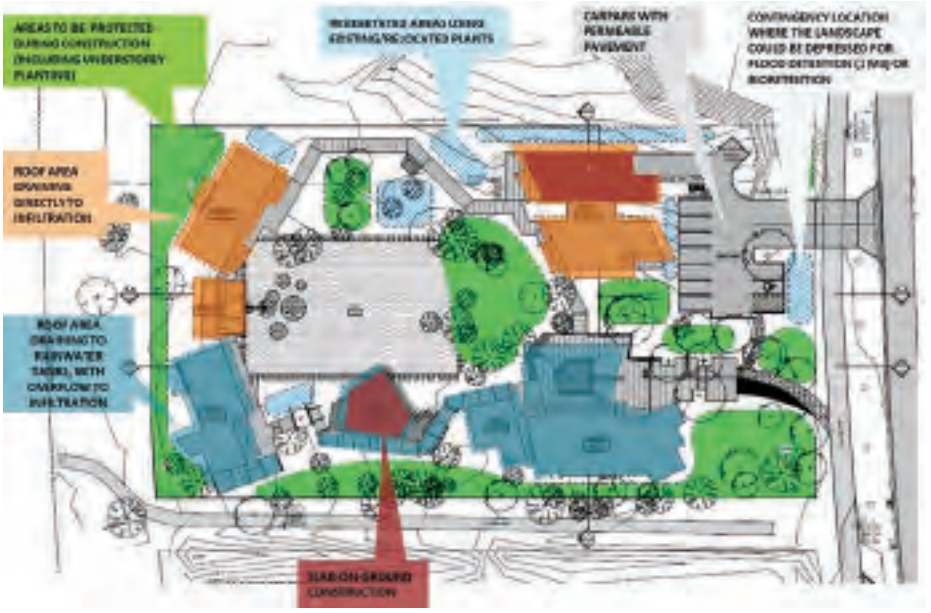

Figure 4 Noosa Flexi-Learning Centre Stormwater Strategy Schematic Layout Plan