streamology
waterway
science and
management

Dr Kirsten Cowley reports on: Innovative stormwater solutions

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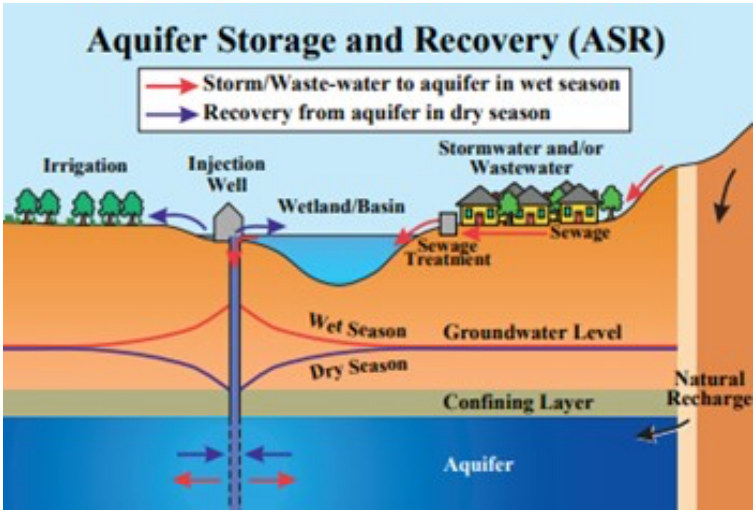
The Stream Team have been involved in providing options for stormwater harvesting and reuse for a proposed residential development on a site with highly erodible soils and threatened vegetation communities. The brief was to review previous documentation and advise on knowledge gaps and stormwater management options to minimize runoff that would exacerbate erosion issues that were already significantly impacting waterways and threatened vegetation both on and off site.

The primary site constraints were related to the soils on the plateau (the development site) and significant erosion issues on the escarpment downslope. Significant erosional features in the form of deep gullies (>5m deep) were already apparent on the mid to lower slopes of the escarpment. There was concern that the proposed residential development, with increased runoff from imperviousness and stormwater infrastructure would significantly exacerbate the erosional processes on the site and also impact on threatened vegetation communities.

Investigations are currently underway into two innovative stormwater solutions to address potential erosion impacts; Aquifer Storage and Recovery and Constructed Endangered Ecological Community Wetlands.

Aquifer Storage and Recovery (ASR) ASR uses the groundwater aquifers as a storage system for stormwater, with options to recover the water later. The potential benefits of ASR include seasonal, emergency or long-term water storage, the restoration of groundwater levels, improvement in groundwater quality, as water supply and to minimise surface storage losses in arid or drought-prone areas.



Conceptual diagram of ASR Source: Water Research Access Portal

ASR opportunities across the Melbourne Region have been investigated previously. Up to a third of the region is suitable for high or medium injection rate ASR projects, almost all of which occurs in the Lower Tertiary Aquifer. The total additional storage volume of aquifers in the 10,565 km2 Melbourne study area was calculated to be 2,800 GL Dudding et al, (2006). Most of

the storage zones contain brackish groundwater, however brackish aquifers make very suitable storage zones for environmental and economic reasons.

Constructed Wetlands – Seasonal Herbaceous Wetlands. Constructed wetlands are a conventional approach to addressing stormwater runoff, as well as providing beneficial water quality outcomes and fauna habitat. Seasonal Herbaceous Wetlands (SHW) are freshwater ephemeral wetlands found in temperate lowland plains of south-eastern Australia. They are isolated, only seasonally inundated, occur within areas of predominantly winter rainfall and on clay soils of the Victorian Volcanic Plains. They are listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) as critically endangered (Threatened Species Scientific Committee 2012). Vegetation assessments for the development site indicated that SHW were likely to be present however they were not detected during field surveys. Although these EECs represent a land use constraint in some ways, the design of the wetland detention basin system around SHW hydrology and processes may have the benefit of potential future offsets under the EPBC Act. Offsets are measures that compensate for the residual adverse impacts of an action (such as a residential development) on protected matters listed under the EPBC Act. Offsets can be traded through a market-based mechanism that brings together potential buyers and sellers of offsets, creating a financial advantage for conservation of threatened species and ecological communities. Due to the seasonality of these ecosystems, there may still be a requirement for conventional detention basins, however if the wetland design was such that there were a number of small SHW within each sub-catchment of the site, then flows to the retention basins may be lowered to allow for greater storage potential within the retention basins during flood events.

While ongoing investigations into these stormwater options may not lead to their application in this instance, it is an example of how working with a sites' environmental attributes and constraints can yield indirect benefits and opportunities.

Seasonal Herbaceous Wetland Source: CHGMA