Submission to Parliamentary Inquiry

by the

Environment and Natural Resources Committee

on

Melbourne’s Future Water Supply

HARVESTING RAINWATER FROM LARGE BUILDINGS
SUMMARY

Melbourne’s storm water is an unrecognized asset. The annual volume of metropolitan storm water is 40% greater than the volume of stream flows into Melbourne’s reservoirs, a difference that will almost certainly increase. From the roofs of Melbourne’s large buildings, a significant amount of good quality urban storm water can be collected, disinfected and distributed through the existing infrastructure, to provide a sustainable source of water. The use of storm water will require innovative policy and some new technology, which is well within the capability of Australia’s scientists and engineers. However, progress will depend on political action by government.

HISTORY

In 1857, when Yan Yean reservoir was completed, Melbourne was a world leader in supplying town water. From the 1880’s its water catchments were protected from human intrusion so as to provide safe drinking water, establishing a tradition of innovation in the management of water supply. From the establishment of the Werribee sewerage farm in the 1890’s, innovation in waste water management has continued.

Until June 2007, the government in Melbourne followed the same water supply formula, collecting most of its water in dams from pristine stream-flows. Notwithstanding the large area of protected catchment, the diminishing amount of water now produced is mass-medicated with fluoride and disinfected with chlorine.

The actual and forecast decrease in stream-flows into the reservoirs has caused a panic reaction from the government. This inquiry is a welcome return to rationality in planning future water supplies.

THE PRESENT

Melbourne already has surplus water: at least 735 GL [billion litres] is spilled into the sea each year, causing environmental stress to metropolitan streams, Port Philip and Bass Strait. This amount is made up of 537 GL of storm water and about 198 GL of effluent from sewage treatment plants. The storm water comes mainly from paved surfaces and roofs. Roof water is less polluted than surface water, but in the metropolitan area they are combined and spilled into the sea. Sourcing town water from non-contaminating roofs would be more socially acceptable than water from paved surfaces, which is polluted with motor oil, cigarette butts, dog droppings etc. Sewage effluent is not yet accepted in Australia and re-cycling by desalination of sea water is energy intensive.

In the 21st century, Melbourne’s ‘dams’ could be the stormwater outlets that collect water from its roofs and pavements. Melbourne Water, backed by CSIRO and the universities has the expertise to produce clean, safe water from the 537 GL/year of storm water that is available. Moreover, water can be produced close to where it is needed and, despite diminishing rainfall, its volume will increase with more development. What is required now is a return to the tradition of innovative development of water resources.

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1 Stormwater Industry Association, Victoria, Submission number 78 to the Victorian Government Inquiry into the Retail Water Industry, 2005

2 Melbourne Water Corporation, Social and Environmental Data, 2006/07
It is worth remembering that when work on the Yan Yean Reservoir was initiated, Melbourne was only 20 years old and had a population less than 100,000. Today, the government in Melbourne seems content to follow the unsustainable practice of extracting more water from diminishing stream-flows or imitating the profligate Arab states in desalinating sea water.

Compared with the significant loss of water to the sea each year from the Melbourne metropolitan area, the optimistic forecast that, in a wet year, it may be possible to ‘save’ 225 GL by upgrading the irrigation infrastructure in the Goulburn Valley, represents only 30% of the amount could be saved every year in the metropolitan area. Moreover the anticipated savings in the Goulburn system are questionable, because much of the supposedly wasted water remains as ground water in the Murray-Darling Basin, which is desperately, and, in some parts terminally, short of water. Harvesting wasted urban storm water would not only allow the government to abandon the N-S pipeline from the Goulburn River to the Sugarloaf reservoir, but also to restore to the Murray-Darling Basin, the 22 GL/year flow of Silver and Wallaby Creeks that were first diverted to Yan Yean in the 1880’s.

PROPOSAL

This submission advocates collecting high-quality water from the roofs of large buildings in those parts of the Melbourne metropolitan area where a significant amount of such water is available. It is shown below, in the Appendix, that in four “industrial nodes”, comprising less than 1% of the total metropolitan area, enough water could be harvested to comprise about 2.4% of Melbourne’s annual consumption.

Industrial buildings are mostly clustered into industrial or commercial zones, allowing the creation of shared or common collection and processing facilities. Thus, the water could be efficiently cleaned and disinfected to urban standards. If all suitable buildings, say those with roofs greater than 1000 m² in the metropolitan area and elsewhere, were equipped to collect water, the amount available would be significant. The danger of contamination can be minimized by using only roofs that are constructed of safe, inert materials.

No data have been found from which the total roof catchment over the metropolitan area could be estimated. Until a measurement of the population of large buildings is available, the proportion of the flows derived from roofs can only be guessed. Here, we assume, on the basis of observation, that 20% of all stormwater could be harvested at 90% efficiency from large roofs such as factories, warehouses, retail showrooms, shopping centres, educational buildings etc, yielding some 95 GL/year. The remaining stormwater, from small roofs and paved surfaces, which is discharged into the storm water drainage system, would require more elaborate processing but is still a valuable source of urban water that should be exploited.

Like sunshine, rain is free and both are significantly undervalued. Once the rain hits the ground a story develops. Landowners in the country usually welcome it, but are subject to restrictions under the Water Act as to how they may use it. On the other hand, city and town governments spend large sums of public money on drainage systems to get rid of their rain water as quickly as possible, implying a negative value to half the rain that falls in Melbourne.

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3 Melbourne Water Corporation, Sustainability Report 2006/07, Statutory Information, Bulk Entitlements.
Harvesting rainwater from small buildings is expensive. Here, we propose harvesting water from roofs of large buildings, clearly a more cost-effective investment than domestic installations. The cost of tanks is about $200/kL of capacity and for a domestic rainwater tank, four to five times its volume can be collected and used each year. However, the optimum performance of a water harvesting system using roofs of large building could incorporate a system to recharge the existing storage and distribution system with harvested roof water. Such an arrangement would probably produce twice as much annual output per unit of storage volume, say, ten times the volume. Therefore, the capital cost of producing 1 kL of water per year would be about $20. This is comparable to the capital cost of producing desalinated water, but with a significantly less adverse effect on the environment. Performance and costs could be estimated with some confidence by a simulation study of water flows in any proposed system.

Unlike the government's current program for expanding Melbourne's water supply, the proposal to harvest storm water should be the subject of public scrutiny through an economic and environmental comparison of the various options for supplying water to Melbourne over the long term and under various suppositions on climate. A comprehensive economic and environmental analysis would evaluate the dis-benefits to the rest of the world, as well as the costs and benefits to the burghers of Melbourne.

The opportunity to expand the water supply by collecting rainwater from large metropolitan buildings, should be fully evaluated before the shortsighted and destructive scheme to extract more water from the Murray-Darling Basin is taken further. That is to say, a thorough evaluation should be undertaken immediately.

A constructive water supply policy would include effective encouragement for the owners of large buildings to collect the rainwater from their roofs and a scheme for the utilization of that water for public consumption, using a parallel approach to that applying to rural landholders. On cursory examination, there do not appear to be any provisions in the Water Act that could be used to progress the harvesting of roof water to augment urban supplies. In which case, the government should amend the act to make sure that the harvesting of water from the roofs of suitably large buildings, say, those greater than 1000 m$^2$, will be both possible and strongly encouraged.

The current policy of the government in Melbourne, which offers conditional subsidies to house-owners to install small rainwater tanks is welcome, but it does little to tackle the supposed shortage of water for the metropolitan area.

RECOMMENDATIONS

1. Amend the Water Act [or create a new Act] to regulate the use of urban stormwater for public purposes, including the power to intercept stormwater flows on private property.

2. Initiate a high priority program for the collection and use of stormwater from roofs of large buildings to augment public water supplies in Melbourne and other cities and towns.
APPENDIX

CALCULATION OF YIELD OF WATER FROM LARGE ROOFS.

The Department of Sustainability and Environment has measured the gross building areas, which they call “footprints”, of 8500 buildings in four “industrial nodes” of the Melbourne metropolitan area, and published a summary of their findings as “Industrial Building Footprints - 2005” at www.dse.vic.gov.au/research/ in the form of a “PowerPoint” presentation.

From measurements of the graphical presentation on page 3 of that publication, the total roof areas of the buildings surveyed was estimated to be 1943 ha. Of these the gross area of the buildings with roofs greater 1000 m² was estimated to be 1697 ha.

On the basis of the “CSIRO/Melbourne Water - Climate Change Study” of March 2005, it is assumed that for the immediate future, these localities will receive 572 mm/year of useful precipitation. This estimate is derived, from the long-term average [650 mm] less 2%, coupled with 90% collection efficiency. It is noted that for the same 12-year period, the decline in annual stream flows into Melbourne's storage reservoirs is forecast to be about 7% and that the collection efficiency of the catchments is about 11%.

The amount of water that could be collected over the four industrial nodes, from buildings greater than 1000 m² is calculated to be 9.6 GL/year. If buildings greater than 500 m² but less than 1000 m² are included, the amount is increased by 0.9 GL to about 10.5 GL/year. The 10% change achieved by increasing the number of buildings by 80% supports the self-evident contention that large buildings provide the most effective and economical opportunities for harvesting stormwater from roofs.

These numbers lend assurance to the estimate of 95 GL/year given above for the amount of good quality water that could be easily harvested for the Melbourne water supply.