Water Security, Healthy Rivers

ENVIRONMENT VICTORIA'S VISION FOR MELBOURNE

Environment Victoria

Water Security, Healthy Rivers: Environment Victoria's Vision for Melbourne

Environment Victoria is the peak non-government, not-for-profit environment organisation in Victoria. Our vision is of a sustainable and healthy environment for all Victorians. To us that means working with groups, governments, businesses and communities to meet the urgent environmental challenges facing our society today.

Environment Victoria has been helping Victorians reduce their ecological footprint for nearly 40 years. And, as the state's peak environmental group, we do so with the support of 150 member organisations, representing thousands of Victorians.

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KEY FACTS

One thousand litres	1,000 litres	1 kilolitre	1 KL
One million litres	1,000,000 litres	1 megalitre	1 ML
One billion litres	1,000,000,000 litres	1 gigalitre	1 GL
Melbourne's total annual water use (GL/year)		400-450 (depending on restrictions)[1]	
Average annual household water use (KL/year)		170-274[2]	
Per capita water use (across all users) (litres/person/day)		331[3]	
Per capita residential water use (litres/person/day)		200-300 (depending on restrictions)[4]	

EXECUTIVE SUMMARY

Melbourne is facing an urgent water crisis. The city is almost completely dependent on rivers for its water supply, and yet inflows to our reservoirs have declined dramatically over the past decade, due to the combined impacts of drought and climate change. Unsustainable extraction of water from our rivers over many years has left them stressed and degraded, and reduced Melbourne's capacity to cope with the extra pressures caused by a growing population, drought and climate change.

And yet this crisis also provides an opportunity to fundamentally re-think our attitudes to water and the value we place on healthy rivers. At the same time as we worry about our dwindling water storages, an amount of water equivalent to Melbourne's total annual water use falls on the city each year and then runs away unused through our stormwater drains. In tackling its urgent problems, Melbourne has an opportunity to take an important step towards becoming a 'water-sensitive city'[5] by re-thinking the way we source, use and dispose of this precious resource.

A water-sensitive city 'lives within its means' by making much more effective use of all the diverse sources of water available to it including rainwater, stormwater and recycled water – without jeopardising the health of its rivers. A diversified system provides greater resilience in the face of future climate or economic shocks, and greater security as it lessens the need to continually seek out 'new' sources of water.

In contrast, the Victorian Government's emphasis on large-scale infrastructure projects such as the Sugarloaf pipeline and the desalination plant at Wonthaggi is reinforcing a centralised, capital and energy-intensive approach to water resource management, and undermining ongoing efforts to improve water use efficiency.

Environment Victoria, as the state's peak non-government environmental organisation, has been working for nearly 40 years

Environment Victoria's Yarra Flow-tilla, 2008.

with our member groups and extensive network of campaigners to meet the urgent environmental challenges facing our society. In recent years our Healthy Rivers Campaign has played a constructive role in helping to shape Victoria's water policy framework – particularly in securing commitments to environmental flows for the Yarra and Thomson rivers and strengthening the initiatives of the State Government's *Our Water Our Future* plan.

Environment Victoria's report *Water Security, Healthy Rivers* demonstrates how Melbourne's short-term needs can be met using alternative water supplies such as recycled water, returning water to our rivers, and 'buying time' to implement sustainable alternative supply options. Significantly improving the water use efficiency of Melbourne's building stock and re-designing our city to make more effective use of rainwater and stormwater will deliver additional savings in the medium term, and help Melbourne make the transition to becoming a 'water-sensitive city'.

EXECUTIVE SUMMARY

Importantly, in this time of global economic uncertainty, investing in making Melbourne a more sustainable city would not only provide badly needed new 'green collar' jobs, but also improve Melbourne's resilience to economic and environmental shocks in the future.

Environment Victoria has identified 10 key actions that can secure Melbourne's future water supply and avoid the need for costly and environmentally risky infrastructure projects such as the Wonthaggi desalination plant and the Sugarloaf pipeline, while returning much-needed water to our rivers and restoring them to health.

Action 1

Treat recycled water from the Eastern Treatment Plant to drinking water standard for introduction to Melbourne's water storages.

Potential addition: 115 GL by 2012

Action 2

Cease logging in Melbourne's water catchments by 2010.

Potential addition: 50-75 GL by 2050

Action 3

Undertake a detailed feasibility study into opportunities for harvesting stormwater close to source, for treatment and addition to water storages or aquifers.

Potential addition: Further investigation required

Action 4

Require all new buildings in existing suburbs to meet a target of a 40% reduction in mains water demand.

Potential addition: 19 GL per annum by 2025;
57 GL per annum by 2055

Action 5

Require all new buildings in greenfield sites to meet a target of a 60-75% reduction in mains water demand.

Potential addition: 18-24 GL per annum by 2025;
58-72 GL per annum by 2055

Action 6

Implement a targeted retrofit program to install water-efficient fittings in 5% of Melbourne households a year.

Action 7

Set minimum standards for major water-using appliances such as washing machines by 2010.

Action 8

Increase rebates for households to install a rainwater tank up to 5 KL in size and plumbed for internal use.

Potential addition for Actions 6, 7, 8:
20 GL per annum by 2012;
105 GL per annum by 2025;
140 GL per annum by 2055

Action 9

Set sector-specific water conservation targets for commercial and industrial water users.

Potential addition: Insufficient data available

Action 10

Immediately deliver environmental flow entitlements to the Thomson and Yarra rivers.

Potential addition: -27 GL per annum now;
-35 GL per annum by 2012

HOW BIG IS THE PROBLEM?

Melbourne uses more than 400 billion litres (or gigalitres GL) of water a year.[6] Approximately 60% of this water is used by the residential sector, 30% by industrial users and the remainder is described as 'non-revenue water' (primarily losses from the system).[7]

Almost all the water used in Melbourne is sourced from rivers and reservoirs. However, inflows to our storages have been declining over the past decade, from a long-term average of 588 GL to an average over the last 10 years of 387 GL, culminating in the record low inflows of 165 GL in 2006.[8]

The Victorian Government's 2004 White Paper on water, *Securing Our Water Future Together*, provided a forward looking policy to encourage more efficient and sustainable water use into the future. In June 2006, the *Central Region Sustainable Water Strategy* based its proposals for addressing Melbourne's water challenges on two scenarios – one using long-term average inflows to reservoirs, and one assuming a continuation of the low flows of the past 10 years.

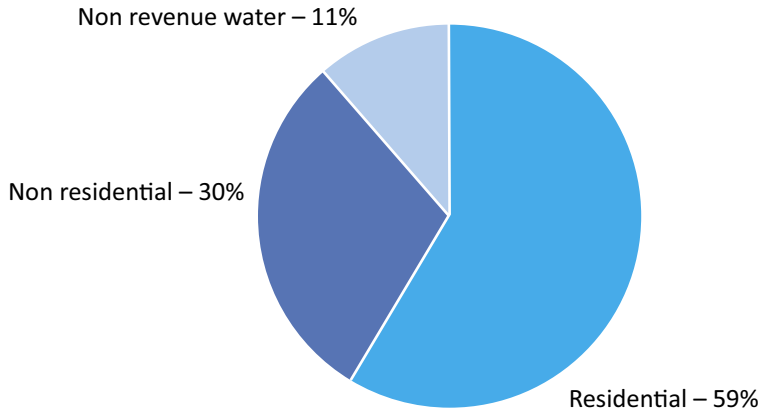

Figure 1. Total consumption – Melbourne[9]

	GL per year	Date on line
Desalination plant	150	End 2011
Sugarloaf pipeline	75	First half 2010
Total	225	End 2011

Table 1. The Government's plan for Melbourne water supplies.[12]

Under these two scenarios, Melbourne is facing a supply shortfall of between 97 and 145 GL in the short term, and between 205 and 300 GL by 2055.[10]

However, in June 2007 Victorian water policy dramatically changed direction with the release of *The Next Stage of the Government's Water Plan*. The plan incorporated a third scenario based on the extreme low inflows experienced in 2004-06, which were particularly influenced by the record low inflows of 2006.[11] This scenario was described as representing a 'step-change in climate'. While Environment Victoria agrees that Melbourne is facing a drier future, it is inappropriate to base planning decisions involving significant financial investment on such a small sample (three years) of data.

Under this $4.9 billion plan the Victorian Government is proposing to augment water supply for Melbourne and other regional centres via investment in a series of large projects, including a desalination plant at Wonthaggi and construction of the Sugarloaf pipeline to take water from the Goulburn catchment to Melbourne.

RISKS ASSOCIATED WITH THE 'NEXT STAGE' PLAN

The Next Stage of the Government's Water Plan's emphasis on large-scale infrastructure investment, specifically the Wonthaggi desalination plant and the Sugarloaf pipeline, represents an inappropriate response to Melbourne's water challenges and carries with it a number of significant risks.

Undermines implementation of more sustainable supply options

The 225 GL of additional water to be provided collectively by the desalination plant and Sugarloaf pipeline is significantly in excess of the estimated shortfall of 97-145 GL predicted for 2015. While it is true that shortfalls are predicted to grow larger with time, reaching a predicted 200-300 GL by 2055, there is adequate opportunity between now and 2055 to implement more sustainable, lower cost, and lower risk options provided immediate shortfalls can be met. However, by massively boosting supply above what is needed in the short term, all incentives for implementing longer-term, more sustainable options are removed.

Undermines progress on water savings

There is a significant risk that the progress made by Melbourne's successful water conservation program – which according to government figures have resulted in a drop in per capita water use of 34% since the 1990s[13] – will be undermined by the influx of large volumes of water from the desalination plant and the Sugarloaf pipeline, which are far in excess of short-term needs. This risk is reinforced by the Government's stated objective to "progressively move back to low level or no restrictions by 2013".[14]

Uncertain data

The Auditor-General's Office found in its 2007-08 review of Victoria's water planning processes that the Next Stage plan was finalised with minimal stakeholder consultation, and inadequate levels of rigour applied to estimate the costs, benefits and risks of some of the key component projects.[15] Given the plan represents a very significant level of public investment, the identified lack of rigour is of concern.

Greenhouse impacts

The desalination plant and Sugarloaf pipeline are both highly energy intensive. The desalination plant is scheduled to use 90 megawatts of electricity per year and the Sugarloaf pipeline a further 10 megawatts to pump water from the Goulburn River to Melbourne.

The Government has committed to offsetting the greenhouse gas emissions from the desalination plant by purchasing Renewable Energy Certificates (REC).[16] However, the Government has also indicated that the RECs for the desalination plant could be sourced from interstate, meaning that the plant's emissions could be offset by projects already counting towards meeting national or another state's renewable energy targets. If this ends up being the case then claims that the plant's energy use will be offset will be inaccurate and the desalination plant will be contributing to increased greenhouse emissions.

Furthermore, even if the emissions from these two energy-intensive projects *are* offset by additional sources of renewable energy, they will be using renewable energy supplies that could otherwise be used to replace existing energy use and hence assist Victoria to reduce its greenhouse gas emissions. The irony is that these projects are being implemented to address water shortages in Melbourne caused at least in part by climate change. But their energy-intensive nature means that they are at best making the task of reducing emissions from other sources more difficult, and at worst contributing more than a million tonnes of carbon dioxide to Victoria's annual greenhouse emissions.[17]

RISKS ASSOCIATED WITH THE 'NEXT STAGE' PLAN

Spiralling economic costs

The desalination plant is estimated to cost $3.1 billion plus $130 million per annum in operating costs.[18] However, since the project was announced last year, the global economic crisis has significantly increased the cost of capital for infrastructure projects, raising the prospect of significant cost blow-outs, which are likely to be translated into an increased price for the water. Given the high cost of desalinated water, it is possible that Melbourne will end up with a large supply of water that is too costly to sell at a profit attractive to a private operator, unless water costs paid by householders rise very significantly above today's levels.

Building a pipeline across the Great Dividing Range from the Goulburn River to Sugarloaf reservoir will cost a further $750 million. Given that some doubt has been raised as to whether the analysis of the potential water savings created by the Foodbowl Modernisation Project was rigorous enough[19], the pipeline represents a significant investment in potential water supplies which may not be realised.

Environmental damage

Both projects pose many environmental risks. The Goulburn River is already highly stressed, and was recently assessed by the Sustainable Rivers Audit as in very poor health.[20] Predicted declines in average surface water availability of up to 41%[21] have not been factored in to estimates of water savings available through irrigation modernisation. Consequently, piping water to Melbourne risks robbing the Goulburn of water it can ill afford to lose, further eroding the values for which it is listed as a Heritage River. In its first years of operation, savings from irrigation modernisation will not yet be available[22], so any water sent down the pipeline will be taken from existing environmental water. So far there has been no assessment of the impact on the Goulburn, Broken, Murray or Snowy rivers of diverting this water, or any proposal to provide alternative water to these stressed river systems.

Because the desalination plant is bigger than any other current or proposed plant in Australia, its potential effects are difficult to estimate. The Environmental Effects Statement for the project leaves many questions unanswered or postpones assessment until the plant is operational. For example, it is estimated that the plant will cause an increase of up to 1.5% in mortality for planktonic larvae in an area extending as far away as Cape Schanck.[23] While the EES suggests that this increase is insignificant in species where larval mortality is already very high, there is little assessment of how the effects will be magnified over time, or flow up through the food chain.

The EES documents are also unable to estimate how much or even what category of waste would be produced by biota and other material entrapped on the intake screens.[24] Landfill is also the only proposed option for the 25-60 tonnes of 'wet sludge' the plant will produce every day and the 70,000 cartridge filters and 12,000 reverse osmosis membranes discarded per year. The EES dismisses options for reuse or recycling as unviable, rather than proposing alternative options.

Social inequity

The Victorian Government has estimated that retail water prices will approximately double by 2012 to pay for new water infrastructure for Melbourne.[25] While there is an argument that historically water has been too cheap and does not reflect the full cost of its provision, nevertheless doubling water prices will have a significant impact on low-income households. Rising prices of essential items such as water increases the vulnerability of households with little control over their usage because they live in rental housing or cannot afford the up-front cost of measures for which rebates are available.[26] There is a risk that the high cost of producing desalinated water will drive up prices further than they would otherwise need to if lower cost, more sustainable options were implemented.

ENVIRONMENT VICTORIA'S VISION FOR A WATER-SENSITIVE CITY

Melbourne is facing an urgent water crisis. We are almost completely dependent on rivers for our water supply, and yet our rivers are already stressed and degraded because we have been taking too much water out of them for too long. At the same time, drought and climate change mean we are facing a drier future, while Melbourne's population and demand for water continues to increase. It is clear Melbourne's water supply system urgently needs to be re-organised onto a more sustainable footing.

Victoria has long had a good reputation for leading water reform in Australia. In tackling its urgent water problems, Melbourne has an opportunity to take an important step towards becoming a 'water-sensitive city'[27] by fundamentally re-thinking our attitudes to water and the value we place on healthy rivers.

In a water-sensitive city, a diverse range of water sources including urban stormwater and recycled wastewater are utilised in an integrated way and at a range of scales (from household to suburb to city-wide) to reduce the vulnerability that comes from over-reliance on a single water source. Taking an integrated approach to water management can deliver a wide range of benefits including supply security, flood protection, waterway health protection, and amenity and recreation.[28]

Importantly, a water-sensitive city also comprises 'water sensitive communities' who provide the social capital for positive water-saving decision-making and behaviours.[29] Melbourne's water-saving achievements, as well as the success of community-based programs such as *WaterMark*[30], have demonstrated that Melburnians are well on their way to being a water sensitive community.

Environment Victoria's vision is for a city that 'lives within its means' by making use of a diverse range of sustainable, decentralised water sources; a city that is resilient in the face of shocks – whether they be economic (such as price rises) or environmental (such as climate change); and a city that protects and values its urban waterways for their biodiversity, recreational and social benefits.

Environment Victoria acknowledges that Melbourne is facing a potential shortfall in water supply in the short term, and it is appropriate for the State Government to be investigating options for increasing supply. However, any investment in additional supply must also be accompanied by a continued focus on improving efficiency. This will both keep the need for expensive augmentation to a minimum, and retain as much water as possible in our rivers to maintain environmental flows. Such an approach avoids the need for capital-intensive and environmentally risky infrastructure projects Victoria can ill afford in these economically uncertain times.

The key to Environment Victoria's plan is to identify sustainable alternatives such as recycled water and stormwater to meet Melbourne's immediate shortfall, 'buying time' needed to implement longer-term sustainable options. The key elements of Environment Victoria's plan are:

- Immediately implement sustainable alternative supplies such as purified recycled water.
- Cease logging in Melbourne's water catchments.
- Transition to a 'water-sensitive city' by improving stormwater management and dramatically improving the water efficiency of our building stock and industry.
- Deliver environmental flows to our rivers.

What is needed now is for the Government to provide leadership in driving the necessary policy and infrastructure changes that will make Melbourne's transition to a water sensitive city a reality.

ENVIRONMENT VICTORIA'S VISION FOR A WATER-SENSITIVE CITY

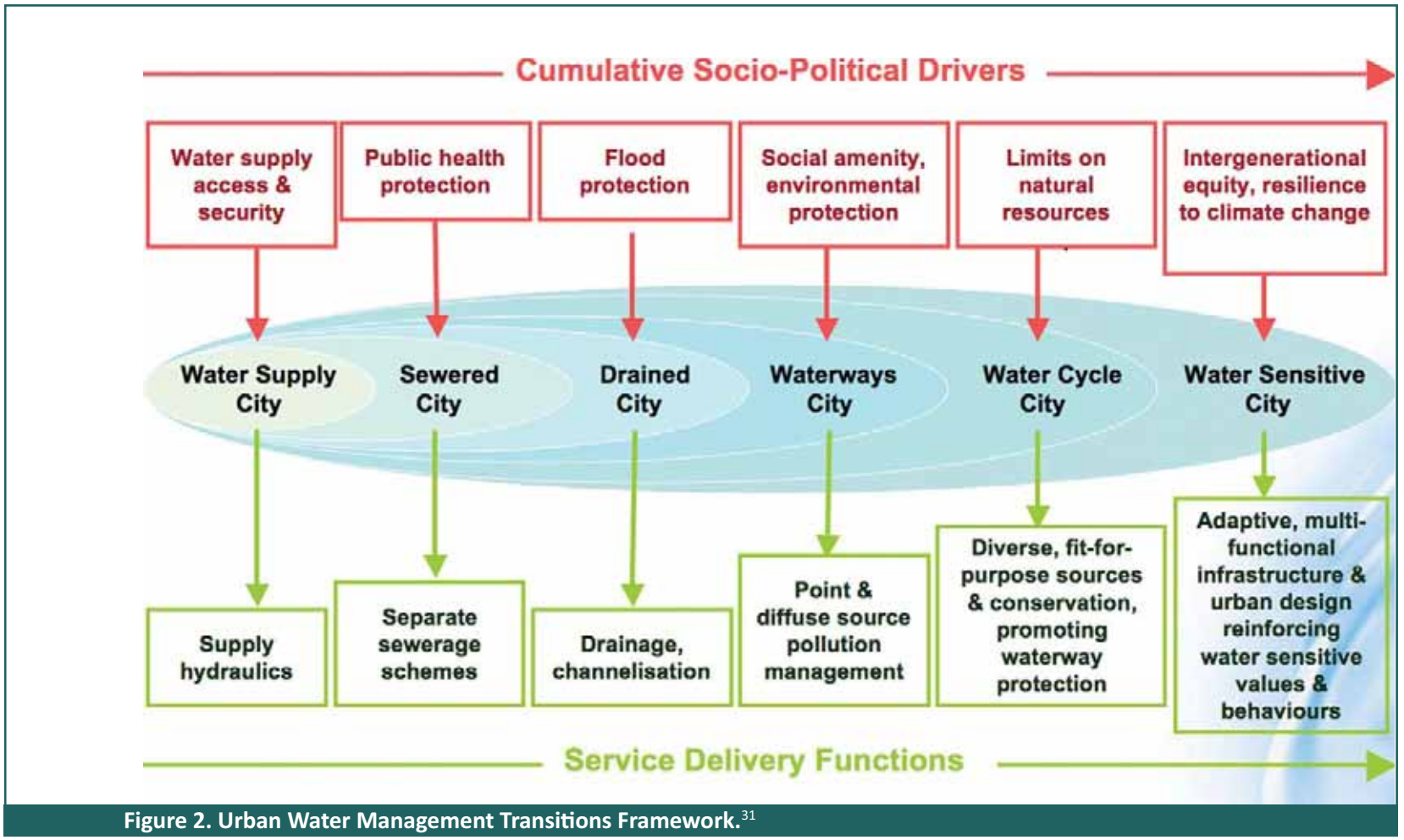

Figure 2. Urban Water Management Transitions Framework.[31]

SUPPLEMENT STORAGES WITH PURIFIED RECYCLED WATER

As part of the Next Stage plan, the Victorian Government reinforced its commitment to upgrade the Eastern Treatment Plant (ETP) to tertiary standard by 2012. This upgrade is expected to produce more than 115 GL of high-grade recycled water.[32]

The Government is currently investigating only two options for making use of this high quality water – pumping it to Gippsland to replace river water for cooling the Latrobe Valley's power stations, and pumping it into the Yarra River to provide environmental flows.[33] Both these options raise serious concerns (see box).

A third option, to use this high-quality water to augment Melbourne's drinking water supply, is not being considered by government at all. This is despite recycled water being a source of water that is independent of rainfall and hence protected from the impact of climate change. Introducing recycled water to Melbourne's water storages would require considerably less infrastructure than development of a desalination plant, while treating recycled water to drinking water standard uses significantly less energy than producing desalinated water.[35]

Introduction of recycled water into the drinking water supply via a water storage (known as indirect potable re-use) would require additional treatment to ensure it met all health requirements. But even taking those costs into account, recycling water for drinking is a more cost-effective option than desalination (see Figure 3).

Environment Victoria acknowledges concerns exist about potentially harmful levels of substances such as endocrine disruptors entering the drinking water supply. However, other jurisdictions around the world have successfully managed these risks for many years and south-east Queensland is currently in the process of introducing recycled water to its water supply. Queensland is using a seven-barrier treatment process including source control, reverse osmosis treatment and exposure to sunlight in the natural environment.[36]

Pipeline feeds the coal industry

Pumping recycled water to Gippsland for use as cooling water in coal-fired power stations will have significant cost and energy impacts. Furthermore, building the necessary pipeline infrastructure represents an inappropriate investment in the coal industry at a time when Victoria needs to be tackling climate change and moving to low emissions power generation.

Taking more water out of our Yarra

The Yarra River Replacement Flows proposal is, in part, being sold as a solution to managing the Yarra's flow stress, when in reality it is a strategy for extracting more water upstream. The 2 km gap between where water will be extracted for Melbourne and where recycled water will be introduced further downstream[34] is likely to seriously degrade a vital stretch of river. There are also concerns that the ultra-pure recycled water will be too sterile to feed the chain of life in the river.

Limitations of current options for use of recycled water.

One of Queensland's leading authorities on the use of recycled water for drinking, Associate Professor Heather Chapman, argues that most members of the scientific community agree it is safe to drink recycled water, and is confident that any risks can be safely managed with a robust risk assessment and management system.[37]

The Victorian Government should allow the people of Melbourne to consider the option of using recycled water to boost our water supplies. We should be cautious in assuming past research on attitudes to recycled water remain valid, particularly in light of recent research that found 74% of people surveyed in south-east Queensland said they would be prepared to drink purified recycled water added to their water supply.[38]

Recent Victorian research has also highlighted that people's

SUPPLEMENT STORAGES WITH PURIFIED RECYCLED WATER

willingness to drink recycled water is directly related to their perceptions about the quality of the product, their trust in the authorities administering the system, and their perception of being treated fairly in the process of implementation.[39] This suggests that rather than passively accepting the risk of negative community attitudes to recycled water, there is much that the Government can do to shape those attitudes and increase the likelihood of indirect potable re-use being accepted.

The Queensland experience has demonstrated that recycled water can be brought online quickly. It is vital that the Victorian Government investigate the feasibility of adding purified water to Melbourne's water storages as an immediate priority.

Action 1

Treat recycled water from the Eastern Treatment Plant to potable standard for introduction to Melbourne's water storages.

Potential addition: 115 GL by 2012

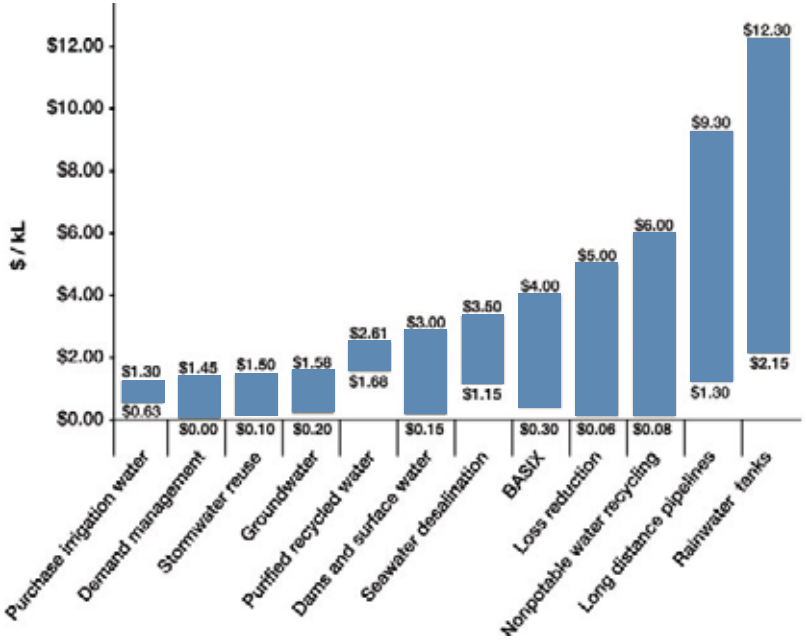

Figure 3. Unit price of water from a range of sources.[40]

REMOVE LOGGING IN MELBOURNE'S WATER CATCHMENTS

Inflows into reservoirs are a function not only of rainfall, but also evaporation, catchment dryness and water use by vegetation. Logging reduces water supply because rapidly growing regrowth uses much more water than old growth forests, thereby reducing the amount left to flow into streams and catchments.[41]

Significant literature exists on the effects of logging on runoff and shows that the uptake of water in regrowth areas causes a significant decrease in streamflows for at least 50 years. An internationally respected research program spanning three decades undertaken in the Victorian Central Highlands has shown that logging activities in wet forests can reduce water yield by 50% for as long as 30 years after logging, and it can take up to 150 years for water yield to return to pre-logged levels.[42]

Logging in Melbourne's principal water catchment, the Thomson, has a particularly significant impact on water yield because approximately two-thirds of the water captured in the storage runs off only one-third of the catchment's area – the high-rainfall Mountain Ash forests of the Baw Baw escarpment. And yet this high rainfall area is where 100% of logging in the catchment occurs.

Modelling done more than 15 years ago demonstrated that continuing logging would reduce water yields by an expected 50 GL per annum by 2050 and would still be reducing water yield as far into the future as 2200.[43] Taken in combination with the effects of continued logging in the Yarra tributaries and the Tarago catchment, which could result in water losses of at least 10 GL by 2050 and 20 GL in the long term,[44] it is estimated that ceasing logging in all of Melbourne's water catchments could yield up to an additional 75 GL per annum by 2050.

Economic analysis conducted in 1992 valued the water produced in the Thomson catchment at approximately three times the value of the wood harvested from logging and concluded that the Victorian community would be $147 million better off if logging ceased.[45] It is reasonable to assume that this disparity could only have increased in the decades since, given that the value of water has increased significantly while the value of the wood has stagnated due to the fixed price contract signed by the previous Victorian Government.[46]

Despite these findings, logging has actually increased in the years since the creation of the Thomson Dam. It has been suggested that active forest management strategies such as forest thinning can act to increase water yield.[47] However, Environment Victoria is not aware of any research conducted in Victoria to back up this claim. In fact it is likely that by opening the forest canopy and encouraging re-generation of understorey vegetation, forest thinning would act to reduce water yield on a similar scale as regrowth after clear-felling.[48]

Finally, climate change is expected to increase catchment dryness and evaporation as well as increase the frequency of bushfires in our forested catchments. This in turn will lead to a greater proportion of high water-using regrowth in our forests over time. Furthermore, as mature forests are more fire-resistant than regrowth, logging exacerbates the risk of bushfire. Given that all these factors will act in concert to reduce inflows to our storages, it is irresponsible to make the situation worse by continuing to log water catchments.

⏩ Action 2

Cease logging in Melbourne's water catchments by 2010.

Potential addition: 50-75 GL by 2050

MAKE BETTER USE OF URBAN STORMWATER

Melbourne uses more than 400 GL of water each year. Meanwhile, a roughly equivalent amount of stormwater that runs off our urban catchment each year is barely utilised[49] (see Figure 4). Not only does runoff represent a very significant untapped resource, but the management of this unused water costs the Victorian community millions of dollars each year in flood protection infrastructure, waterway rehabilitation and impacts on Port Phillip Bay.

The trend towards higher density development in Melbourne is increasing the proportion of impervious surfaces within the catchment and consequently increasing the volume and frequency of runoff into our rivers. In an urban area with a high proportion of impervious surfaces, runoff is produced virtually any time it rains, discharging directly from drains to our creeks, rivers and bays and causing significant degradation and pollution.[50] The volume of stormwater that ideally needs to be retained to protect waterways exceeds the volume of water used in Melbourne.[51]

At the same time, Melburnians are demanding greater environmental and amenity benefits from their urban waterways and wetlands, prompting government and water authorities to invest significant amounts of money in cleaning up waterways and improving water quality. Improved management of stormwater would complement this investment by doing more to address the causes as well as the symptoms of waterway degradation.

Higher density development can also put pressure on stormwater infrastructure, requiring investment in costly upgrades. If stormwater can be retained on-site to reduce runoff frequency, costly investment in flood protection infrastructure upgrades – often running to the millions of dollars – can be deferred or avoided.[52]

Investigations of stormwater re-use undertaken by the Victorian Government to date have tended to focus narrowly on the bottom of the catchment, for instance by examining the viability of harvesting stormwater from key sites on the Yarra such as Dights Falls.[53] However, such an approach fails to capture any of the benefits in improved stream health, avoided water treatment and cost savings on flood protection infrastructure that would be delivered by capturing and using stormwater closer to source.

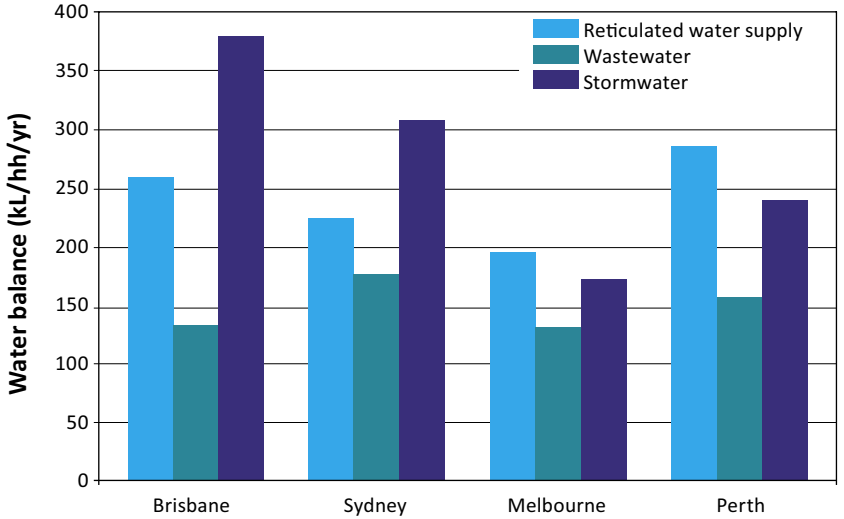

Figure 4. Wastewater and stormwater generated in Australian cities.[54]

A recent study concluded that incorporating best practice stormwater management targets into requirements for new homes (for example by installing a rainwater tank connected to toilet and washing machine) would not only provide private benefits to the householder, but also deliver a significant benefit to wider society. These benefits, including a reduction in run-off and pollutants entering waterways, flood mitigation, and increased water savings, were estimated at over $600 million a year.[55]

MAKE BETTER USE OF URBAN STORMWATER

Opportunities for increasing our use of rainwater and stormwater at a household and suburb level are discussed in more detail in the following sections.

There are also significant opportunities for increasing the quantities of stormwater captured and re-used from commercial and industrial sites across Melbourne. As Melbourne's water restrictions continue, we are beginning to see a greater utilisation of urban stormwater at a local level to water parks and gardens (see Case Study 1).

However, the very significant volumes running off large commercial buildings have not been recognised for their potential to contribute to water supplies at a suburb or metropolitan scale. In these situations where runoff volumes are much greater than those that can be used on-site, there is an opportunity to capture this extra water, treat it locally and then pipe it to a local service reservoir for addition to water supplies.[56] However, to date, inadequate attention has been given to investigating the potential of industrial and commercial stormwater re-use.

Stormwater harvesting via wetlands and aquifers for drinking water use is being trialled by CSIRO and partners in Adelaide, and results so far indicate it may be economically viable. If similar studies were conducted in Melbourne and concluded that such an approach was feasible, CSIRO estimates that stormwater harvesting has the potential to reduce urban water consumption by as much as 100 GL per annum.[57] However, until such studies are undertaken, it is not possible to estimate the potential additional water provided by this option.

Action 3

Undertake a detailed feasibility study into opportunities for harvesting stormwater close to source, for treatment and addition to water storages or aquifers.

Potential addition: Further investigation required

Altona Green Park

Due to the lack of publicly available active recreational space in the area, Hobsons Bay City Council teamed up with Altona Green Primary School to upgrade the existing school playground and sports facilities and to develop vacant land into a financially successful and environmentally sustainable, recreational and residential area. A portion of the area was developed for residential purposes, in order to finance the recreational aspect of the project.

The stormwater from these residential properties is diverted into a filter system underneath the recreational park. Run-off from the main road is diverted towards the park and into a filtration system, while excess stormwater from the two ovals is also collected. All stormwater is collected in a 400,000 litre underground storage tank, which is then used for irrigation on the two sports ovals.

Previously stormwater from the area was diverted directly into Port Phillip Bay. As a result of the project much less water and pollution is diverted to the traditional stormwater system, easing the stress on Port Phillip Bay.[58]

Case Study 1. Use of urban stormwater on parks and gardens.

MAKE NEW BUILDINGS MORE WATER EFFICIENT

Making new buildings more water-efficient is one of the most cost-effective ways to achieve water savings – it is much less costly to build water-efficient systems and appliances into the design and construction of new homes than it is to retrofit later.

Current Victorian building and plumbing regulations – 5 Star Standards – require new homeowners and renovators to meet water and energy efficiency standards by choosing between a rainwater tank (and equivalent such as a dual pipe system) or a solar hot water service. The current requirements for a rainwater tank are that it holds at least 2,000 litres (2 KL), drains a roof area of at least 50m^2 and is connected to the toilet for flushing. This standard is currently being reviewed.

The most optimistic assessment of how much water the 5 Star Standards are currently saving in new homes puts the figure at 35 KL per year,[60] or approximately 15% of annual household water use.[61] However, this same study also concluded that installing basic water-saving measures (such as water efficient showerheads and taps, a 4.5/3 litre toilet, and a hot water recirculator[62]) could achieve the same water savings as the current 5 Star Standards but at lower cost – $0.77 per KL compared with $1.06 per KL.[63]

If water-efficient appliances such as dishwashers and washing machines are added to this suite of water-saving measures, household water savings of 30% can be achieved for less than $4 per KL.[64] Measures for improving the water-efficiency of appliances are discussed in the next section.

Installing rainwater tanks to reduce rainwater run-off from new dwellings in existing suburbs can increase water savings further. A recent study concluded that several different dwelling types and tank combinations could achieve cost-effective[65] water savings – the best achieving savings of more than 80 KL (or around 36% of household water use) per year at a cost of $2.47 per KL. This compares with

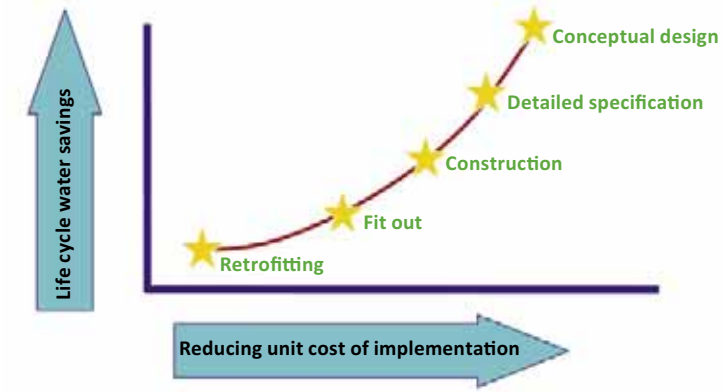

Figure 5. Life cycle savings from effective planning.[59]

estimated savings of only 9 KL per year at a cost of $6.73 per KL for the current standards.[66]

Importantly, this study also concluded that incorporating stormwater management targets into building regulations could be justified on the basis of the substantial benefits delivered to wider society. These benefits, which come in the form of reduced runoff and pollutant loads entering waterways, flood mitigation and increased water savings, have been estimated at over $600 million annually.[67]

The water savings and cost of rainwater harvesting vary significantly depending on the type of dwelling, ie. house or apartment. Consequently, it is difficult to estimate the metropolitan-wide water savings that could be achieved by introducing stormwater management targets into building standards.

However, the New South Wales BASIX standard, which has set a target of 40% reduction in mains water demand in new and renovated homes and apartments, provides a guide to what is possible.[68] It is estimated water savings from BASIX are being

MAKE NEW BUILDINGS MORE WATER EFFICIENT

achieved at a cost of between $0.30 and $4.00 (see Figure 3).

In its current review of 5 Star Standards, the Victorian Government has an opportunity to significantly increase their effectiveness by adopting a target of a 40% reduction in water demand for all new homes and apartments in existing suburbs.

Approximately 347,700 new dwellings will be built in metropolitan Melbourne over the next 15 years, of which nearly 140,000 will be built in greenfield growth areas. Another 208,000 or about 14,000 per year will be built as infill development in established areas.[70]

At this rate of growth, adopting a 40% target for new dwellings in existing suburbs could achieve water savings of 19 GL per year by 2025, rising to 57 GL per year by 2055.[71]

Action 4

Require all new buildings in existing suburbs to meet a target of a 40% reduction in mains water demand.

Potential addition: 19 GL per annum by 2025; 57 GL per annum by 2055[72]

While significant water savings can be achieved in any new building through appropriate design and construction, even greater savings are possible in 'greenfield' sites in new urban areas. As new developments usually have a large number of allotments and sufficient space for storage of local water sources, they offer the most cost-effective range of alternative water supply options, including suburb-scale rainwater harvesting, stormwater re-use and dual pipe recycling systems.

For example, a recent study of water saving options in the Werribee Plains region found that household water use in greenfield sites could be reduced by up to 76%. The most cost-effective option – rainwater harvesting – reduced water use by 60% at a cost of $2.50 per KL.[73] Importantly, implementing these water conservation measures in a new development was found to reduce stormwater run-off to pre-development levels, thereby delivering significant benefits to the wider community from improved stormwater management.[74]

A new development being planned at Armstrong Creek near Geelong shows that even greater savings can be achieved in areas where alternative water sources such as recycled water can be cost-effectively utilised (see Case Study 3).

Recent research has indicated that the building and development

WestWyck Eco-village housing development

WestWyck occupies the site of the former Brunswick West Primary School in inner Melbourne. WestWyck wants to highlight that good design doesn't compromise normal Australian values for residential living.

The key sustainability principles that justify WestWyck being termed an 'ecovillage' are materials efficiency, energy efficiency and water efficiency. The water management regime is pushing new boundaries in reducing reliance on mains water and minimising the discharge from the site of water via the stormwater and sewerage systems.

Water saving devices (flow restrictors, efficient appliances and efficient fittings) are installed, and harvested roof water is used to replace as much of the mains water as possible, with this being largely used as the supply source for the hot water system. Treatment and re-application of used water further reduces reliance on mains supply. The greywater treatment plant receives bathroom and laundry water and subjects it to bacterial, membrane and UV treatment to create Class A water for reuse in toilet flushing and gardens and, subject to approval, the laundries.[69]

Case Study 2. Water efficiency in new buildings in existing suburbs.

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industry would welcome increased regulation to encourage wider adoption of water efficiency measures and alternative water sources (such as recycled water). The view expressed by the majority of more than 30 professionals interviewed was that mandatory regulation would help to remove some of the cost barriers to implementation by creating a level playing field.[76]

Acknowledging that different water savings will be achievable in different areas depending on how cost-effectively alternative water sources can be implemented, it should be possible to achieve water savings of between 60 and 75% across all greenfield developments.

Assuming 9,000 to 10,000 dwellings per year will be built in greenfield development sites over the next 15 years, and assuming all these new homes reduce their demand on the potable water supply system by 60-75%, water savings of between 18 and 24 GL per annum could be achieved by 2025, rising to 58-72 GL by 2055.[77]

Armstrong Creek Development – Geelong

The City of Geelong has adopted an integrated water cycle approach for its new Armstrong Creek development. This approach, involving the use of rainwater tanks, water efficient appliances and gardens, as well as wastewater re-use from local treatment plants, is expected to achieve a 75% reduction in mains water demand, a 63% reduction in wastewater discharges and significant reductions in greenhouse gas emissions. This option not only achieved the greatest water savings but was also found to be the most cost-effective.

Importantly, the water savings achieved would also defer need for the Melbourne to Geelong pipeline for 19 years (from 2014 to 2033), saving the Victorian community about $80 million in infrastructure costs.[75]

Case Study 3. Water efficiency in greenfield developments.

Action 5

Require all new buildings in greenfield sites to meet a target of a 60-75% reduction in mains water demand.

Potential addition: 18-24 GL per annum by 2025; 58-72 GL per annum by 2055[78]

There is also an urgent need to improve the water and energy efficiency of Melbourne's non-residential building stock, for which there are no minimum standards at all. As Case Study 4 illustrates, there are ample opportunities for saving water in commercial buildings through better design and the installation of efficient fittings.

The 60L Green Building

The 60L Green Building – the home of Environment Victoria – uses 75% less water than a conventional office building of similar size and class. Key features of the 60L water system include water-efficient fixtures and fittings (such as low flush toilets and waterless urinals), and the harvesting of rainwater and its treatment on-site to produce a potable water supply for building occupants. On average, 60L occupants use only about 15 litres of water per person per day.

60L also has its own sewage treatment plant, which is designed to treat all of the grey-water (basins and sinks) and black-water (sewage) to produce treated water suitable for recycling, to flush the toilets and irrigate the roof garden and landscape features. Problems with the sewage treatment plant have prevented recycling of treated water but recent rectification works by the contractor mean that final commissioning of the system is expected to commence in late 2008.[79]

Case Study 4. Water efficiency in commercial buildings.

MAKE EXISTING BUILDINGS MORE WATER EFFICIENT

Melburnians have made significant progress on water conservation in recent years.[80] These gains have been achieved through a combination of water restrictions and education and incentive programs to encourage behaviour change.

However, while restrictions remain in place there has to be some doubt as to how much water savings have been due to restrictions versus underlying permanent behaviour change. Given the State Government's intention to ease water restrictions once the desalination plant and other projects come online,[81] there is a risk that water use will rise dramatically once restrictions are lifted, thereby undoing all the progress achieved in recent years.

Furthermore, there is a limit to the effectiveness of rebate schemes as a behaviour change tool, as they reach only those people who can afford the up-front cost of installation, and excludes a significant proportion of householders such as renters altogether. The Victorian Government has a responsibility to take steps to reduce the vulnerability of low-income households (particularly tenants) to rising prices of essential services such as water, particularly through improving the water efficiency of their homes. Options such as installing rainwater tanks and other water efficiency measures carry an initial expense that is likely to be prohibitive for many low-income households, while tenants lack the control over the quality of their housing that would allow them to reduce their household bills.

Given the seriousness of Melbourne's water challenges, it is imperative that the Government 'lock in' water savings permanently by developing a clear policy agenda to dramatically improve the water (and energy) efficiency of Victoria's entire existing building stock. For example, while dual flush toilets have been on the market for over a decade, around 30% of Melbourne households are still without one.[82] This figure is likely to be much higher for public and commercial buildings.

A retrofit program will require regulations and programs that will cover existing buildings of all types, fittings and appliances used within these buildings, and apply to both rental and freehold properties. This is also true for both new and existing non-residential building stock, for which there are currently no water efficiency standards at all.

At the same time, it is essential the Victorian Government continues to build on the enthusiasm many Melburnians have shown for saving water by continuing to communicate a clear water conservation message to the community. As has been mentioned earlier, Environment Victoria has serious concerns that the provision of excessive amounts of 'new' water in the short term through projects such as the desalination plant will seriously undermine the success of community education programs into the future.

Substantially upgrading the water efficiency of Melbourne's housing stock will require a mix of policy measures, including:

- A targeted retrofit program to implement the most cost-effective measures in all homes (such as water-efficient showerheads, toilets, or equivalent flush-reducing measures).
- Introduction of minimum standards for water-using appliances such as washing machines and evaporative coolers.
- Increasing incentives for the installation of rainwater tanks plumbed for internal use (ie. for toilet flushing and washing machine).

Targeted retrofit program

A recent study exploring water saving opportunities in the Werribee Plains region west of Melbourne concluded that water savings of 28%

could be achieved simply through the installation of water-efficient fittings and appliances, at a cost of less than $4.00 per KL.[83]

Recent social research has indicated a very high level of support for basic water-saving measures such as water-efficient taps, showerheads and washing machines, which suggests that people would welcome government moving decisively to speed up the current rates of efficiency improvements.[84]

The simplest measure to deliver a 'renovation rescue' package for all our buildings would be for the Victorian Government to require that all buildings meet acceptable environmental performance at the time of sale or lease. Standards could be introduced in the next 12 months and then increased over the next five years as we build the workforce and skills that will be necessary to retrofit our entire building stock. Such an approach would have the added advantage of spreading the responsibility for improving our building stock across the whole community, not just new home buyers and builders. It would also remove the split incentive that sees many renters and commercial tenants inhabiting buildings with poor water efficiency, but with no incentive or ability to invest in environmental measures.

A staged approach to improving the water and energy efficiency of Victoria's existing building stock should be implemented:

- 2009/10, require mandatory auditing and disclosure of water and energy use of all buildings sold or leased.
- 2011, require that all buildings sold or leased meet minimum standards for water and energy use.
- 2011-2020, introduce progressive tightening of minimum standards.

A number of models for financing such a targeted retrofit program exist. One option would see the upgrade of Melbourne's housing stock managed by the metropolitan water retailers and financed through a system of Commonwealth Government loans made to the Victorian Government on their behalf. The loan funds would cover the up-front cost of upgrades, while participating customers would agree to pay future bills at the current amount until such time as the value of the water savings paid back the retailer. The water retailers would then repay the Victorian Government which in turn would repay the initial Commonwealth loan.[85] Under this model, Melbourne could upgrade 50% of its housing stock at no upfront cost to households in a little over 10 years.

Water-efficient house in Northcote – a personal experience

"When we moved in to our 70-year-old Edwardian house in 2005, one of the first things we did was install a 5,000 litre tank draining our whole roof (180 m^2) which we use for toilet, washing machine, laundry cold tap and garden-watering.

"Since the tank has gone in, our (four-person) household water use has gone down from 389 litres per day to 169 litres per day. That's a reduction of nearly 60%, achieved during some of Melbourne's driest years. And that's even with watering a new garden and washing nappies for our toddler.

"Once our native garden is established and our son is toilet-trained, and so our washing and watering needs reduce a bit, we plan to connect the tank to the hot water to reduce our demand on mains supplies even further."[86]

Case Study 5. Water efficiency in existing homes.

Action 6

Implement a targeted retrofit program to install water-efficient fittings in 5% of Melbourne households a year.

Potential addition: Total retrofit package savings at end of section

MAKE EXISTING BUILDINGS MORE WATER EFFICIENT

Improve efficiency of major water-using appliances

Current legislation requires only that water-using appliances be labelled with water consumption information. There are no regulations requiring a minimum standard of performance. The Victorian Government should work with the Federal Government to fast-track regulations and minimum standards for water-using appliances. If the Federal Government does not move rapidly enough, the State Government should introduce its own legislation and regulations for all water-using appliances, similar to the Federal Government's Mandatory Energy Performance Standards. Such standards would specify minimum water-use performance standards for appliances such as dishwashers, washing machines and evaporative coolers manufactured or imported into Victoria or Australia.

It has been estimated that installing water-efficient washing machines in 400,000 Melbourne homes by 2015 could save 8.5 GL of water.[87] The immediate establishment of minimum standards for appliances such as washing machines could see replacement of all inefficient machines within approximately 10 years. This process of gradual replacement could be sped up by a program of incentives such as rebates to encourage consumers to choose water-efficient options, particularly in the lead-up to the introduction of the minimum standards.

⏩ Action 7

Set minimum standards for major water-using appliances such as washing machines by 2010.

Potential addition: Total retrofit package savings at end of section

Rainwater tanks

Rainwater tanks have proved to be an extremely popular water-saving measure among Melburnians, with the rate of tank installation increasing rapidly in recent years. However, despite this recent growth in popularity, less than 20% of Melbourne households have a tank,[88] and the vast majority are not plumbed for internal use.

Connecting water tanks to internal uses such as toilet flushing and washing machines has a double benefit. Firstly, it means these uses are no longer completely reliant on mains water supplies. Secondly, these tanks capture a much higher proportion of total runoff as they fill and refill several times a year, unlike tanks used for garden watering, which typically stay full over winter. Consequently, despite the best intentions of householders, most of Melbourne's installed tanks are not necessarily having a significant impact on reducing water demand, or on reducing stormwater run-off and resultant waterway degradation.

Recent studies conclude that installing a 5 KL tank draining 200m^2 of roof area and connected to toilet, washing machine, shower and garden, could achieve savings of 80 KL per year at a cost of $2.47 per KL. Even the installation of a smaller 2 KL tank could achieve savings of more than 60 KL per year (nearly 30% of household water use), provided it drained 100% of roof area and was connected to a range of end-uses.[89]

As not all houses are suited to the cost-effective retrofit of a rainwater tank, it is appropriate that tank installation in existing housing remains voluntary. However, there is clearly scope for improving the incentive for tanks to be connected to internal household uses such as the toilet, laundry and hot water, and hence to significantly increase their contribution to alternative water supplies. Preliminary results from a study currently underway in Mt Evelyn in Melbourne's eastern suburbs indicate that the current rebate is too low – only 1 out of 100 households participating in a tendering process were prepared to install a tank in return for the current rebate.[90]

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There is also scope for government to speed up the rate of installation that could be achieved through a voluntary program alone, by conducting an audit of suitable homes (particularly across the higher rainfall areas of eastern Melbourne), and targeting rebates and other incentive programs to homes where tank installation is most cost-effective. It is reasonable to expect that such a large-scale program could achieve cost-savings through bulk purchase and installation that would lower the unit cost of each retrofit further.[91]

Successful rebate schemes have demonstrated that relatively small amounts of public money are capable of leveraging significant private investment. The demonstrated benefits to the wider community of making greater use of rainwater and stormwater at a household level provide a powerful argument for increasing the current rebate to a level that would encourage households to install tanks of a sufficient size that are plumbed for internal use.

⏩ Action 8

Increase rebates for households to install a rainwater tank up to 5 KL in size and plumbed for internal use.

Potential addition: Total retrofit package savings at end of section

A targeted retrofit program to install water-efficient fittings in 5% of Melbourne homes a year, combined with a phase-out of inefficient water-using appliances, would see half of Melbourne's homes using 30% less water within 10 years, and all of Melbourne's existing housing stock upgraded by 2030.[92]

Combined with an enhanced rebate program to encourage householders to install tanks plumbed for internal use, it is reasonable to expect up to half of retrofitted houses could achieve water savings of 50% or more.

Assuming 5% of Melbourne's 1.5 million homes[93] are retrofitted each year, with half reducing water demand by 30% and half reducing demand by 50%, savings of nearly 7 GL per annum could be achieved.

Upgrade Melbourne's housing stock to use 30-50% less water by implementing **Action 6, Action 7 and Action 8.**

Potential addition: 20 GL per annum by 2012;
105 GL per annum by 2025;
140 GL per annum by 2055[94]

IMPROVE INDUSTRIAL AND COMMERCIAL WATER EFFICIENCY

Industry accounts for about 30% of Melbourne's total water use, accounting for more than 130 GL per year.[95] About half of this industrial water is used by just 1500 companies, a third of which are in the manufacturing sector, with the remaining 122,000 businesses using the rest. Hospitals, parks and golf courses, universities and hotels also feature in the top 1500 water users.[96]

The Victorian Government has not set firm targets for industrial water savings, but is expecting the sector to reduce its water consumption by 1% per annum or an additional 8 GL of water a year by 2015.[97]

Victoria's 250 largest industrial water and energy users[98] are required by the EREP (Environment and Resource Efficiency Plans) program to prepare a plan that identifies actions to reduce energy and water use and waste generation. Managed by the Environment Protection Authority, businesses are required to implement actions with a three year or better payback period and report on actions annually. More than 70% of the sites currently registered with the program are in the manufacturing sector.[99] It is expected that the program will deliver water savings of 10% per annum[100], although accurate data that could provide a basis for the setting of water saving targets for the industrial sector are not yet available, as the program is only in its first year of operation.

As part of the ongoing process of monitoring and review of the EREP program, the State Government should consider all options for improving water savings over time, including extending the requirement for implementation to all actions with a five-year payback or less, and/or lowering the water and energy thresholds that trigger an EREP process.

Only businesses that use large amounts of water and energy at an individual site are captured by the EREP scheme. Consequently, businesses (for example hotel chains) that collectively use large amounts of water and energy over several sites, none of which individually trigger an EREP process, are excluded.

The Hotel Ibis Melbourne

The Hotel Ibis Melbourne is a 250-room, three star hotel on the northern fringe of Melbourne's CBD. The hotel has implemented a range of initiatives to cut water use, including installing shower timers in all rooms and putting flow restrictors on all taps and showerheads. It has also replaced its public toilets with dual flush models and installed sensors in all urinals, fixed leaks, and installed water-efficient washing machines. The hotel also has meters that record hot and cold water use in the kitchen.

While the hotel's water saving projects are ongoing, its water use has been consistently lower than the baseline benchmark of 278 litres per guest per night, recording 246 litres in the third year of the program. The hotel is looking at installing rainwater tanks on its roof and meters on hotel water towers to further improve data collection.[101]

Case Study 6. Water efficiency in the hotel industry.

The Federal Government's Energy Efficiency Opportunities Program operates on a corporate basis, requiring large energy-using businesses to identify, evaluate and report publicly on cost effective energy savings opportunities.[102] There is an opportunity to incorporate water-saving requirements into this program, and capture the corporate entities currently excluded by EREP without adding significantly to business reporting requirements. If the Federal Government does not extend the EEO Program to water, the Victorian Government should act to ensure these businesses are covered either by restructuring EREP or by introducing a separate scheme.

Medium-sized businesses that use more than 10 million litres (ML)

IMPROVE INDUSTRIAL AND COMMERCIAL WATER EFFICIENCY

per annum are required by the waterMAP program (managed by the Department of Sustainability and Environment) to develop a water Management Action Plan (waterMAP). WaterMAP requires these businesses to assess their water usage, identify opportunities for water savings, prepare an action plan to implement water saving activities, and annually report on the implementation of water conservation activities. This program currently covers 1,250 businesses in Melbourne, and is expected to generate savings of 5 GL per annum in Melbourne.[103]

The remaining 122,000 businesses in Melbourne that are not covered by these programs use less water individually, but collectively use about 66 GL of water a year.[105] A program to target water consumption within high water-using sectors could save considerable quantities of additional water. For example, there is significant scope to improve the water efficiency of commercial buildings and within the food and restaurant sector (see Case Study 7).

While available data does not support the setting of specific targets for water-savings in the small business sector at this time, the Victorian Government needs to demonstrate its commitment to driving increased efficiency by implementing a program to:

- Audit commercial and industrial water use to identify priority sectors.
- Set sector-specific water-saving targets.
- Provide targeted assistance and appropriate regulatory measures.

⏩ Action 9

Set sector-specific water conservation targets for commercial and industrial water users.

Potential addition: Insufficient data available

Water efficient wok stoves

A conventional wok stove as used in hundreds of Asian restaurants around Melbourne can use up to 5,000 litres of water a day, or 4 million litres a year.

The Gold Leaf Restaurant in Sunshine has reduced its water consumption by about 12,000 litres a day by implementing a range of water-saving measures including the replacement of its old water-cooled wok stove with a water-efficient air-cooled model.[104]

Case Study 7. Water efficiency in the restaurant sector.

DELIVER ENVIRONMENTAL FLOWS TO RIVERS

The Victorian Government, in its 2004 White Paper *Securing Our Water Future Together*, stated that:

> *"The management of water will be based on an understanding that a healthy economy and society is dependent on a healthy environment."*

River health is the litmus test of how sustainable our water use is. By this measure it is clear that water use in our homes, industry and agricultural businesses is unsustainable. Many of the region's rivers are seriously degraded because we take too much water from them and put too much pollution back into them.

The Yarra and Thomson river catchments supply Melbourne with some of the finest water in the world. But as more and more water is extracted, river health is under increasing stress. In the Yarra catchment, only five out of 34 reaches are in good condition or better, and on the Thomson all reaches below the Thomson dam are in moderate or poor condition.[106]

The past 11 years of dry conditions have had a much greater impact on river systems than on other users. The Yarra's flows are down to just 20% of the long-term average, which represents 13% of natural flows.

Long-term average flow	**1298 ML/d**
Natural flow (had no water been extracted)	**2203 ML/d**
Last 12 months (August 07-July 08)	**259 ML/d**

Table 2. Average daily flows (ML/d) at the Warrandyte gauging station in the Yarra River.[107]

For a river, a healthy environmental flow – changing in rhythm with the seasons – is vital. It flushes along pollutants, transports nutrients to where they are needed and provides fish and other creatures with the right conditions to breed.

In recent years the Victorian Government has committed to actions that would, for the first time in history, provide the Yarra and Thomson with a secure entitlement to a portion of their own flow.[108] Both entitlements have been 'qualified' by the Minister for Water, or put on hold until Melbourne is back to low level water restrictions. A sustainable water future must deliver on the commitment to provide our rivers with environmental water entitlements.

Thomson. An environmental flow entitlement of 10 GL was set aside for the Thomson River in 2005.[109] This was followed by commitments in the Central Region Sustainable Water Strategy (CRSWS) to provide an additional 8 GL to the Thomson River by 2012.[110] Recent scientific recommendations indicate that up to 47 GL is needed to achieve a healthy river.[111] In light of this, it is clear that the current entitlement of 10 GL is drastically insufficient. What's worse is that even the promised 10 GL is currently 'on hold' or being withheld until Melbourne is back to low level water restrictions.

Yarra. The 2006 bulk entitlement for the Yarra River sets aside 17 GL for use as environmental flow. Melbourne Water must also comply with passing flow rules for the Yarra River in its management of water supply for consumptive use. Not only is this 17 GL being withheld, but a further qualification by the Minister for Water in October 2007 reduced the minimum passing flow requirements, allowing for an additional 10 GL to be taken from the already flow-stressed river.

⏩ Action 10

Immediately deliver environmental flow entitlements to the Thomson and Yarra rivers.

Potential addition: -10 GL and -17 GL now;
-18 GL and -17 GL by 2012

ADAPTIVE MANAGEMENT

Because the Victorian Government failed to act sooner to implement sustainable water supply options, Melbourne is now in a situation where it seems inevitable some new water supply will be needed in the short term. The Government's response to this supply crisis has been to put its faith in environmentally and economically risky large-scale infrastructure projects as a 'silver bullet' solution to our water problems.

A more appropriate risk management framework would treat capital and energy-intensive supply options such as desalination as contingency measures, ready to be rolled out in the event they are needed, rather than as first order priorities.

An 'adaptive management' framework that prioritises more sustainable sources of water to meet immediate needs (such as those outlined in this plan) can provide relatively low-cost insurance against a range of future uncertainties, while limiting the risks of over-investing in long-lived assets that later prove not to have been needed. These uncertainties include future rainfall patterns, the true level of underlying demand for water once restrictions are eased, and trends in technology that could deliver most cost-effective solutions in the future if investment can be safely delayed.[112]

Environment Victoria does not believe that a large-scale 150 GL desalination plant is a necessary and wise investment in Mebourne's water infrastructure. If the State Government is determined to proceed with desalination, a small-scale, flexible plant that can be turned on or off as needed would have much smaller costs and environmental impacts than the proposed Wonthaggi plant, and could still provide the rain-independent supply sought by Government.

If such a desalination plant is to be pursued and passes all environmental assessments it should:

- Have its Green Power purchase audited and reported upon annually by government, eg EPA.
- Be built in stages to maximise flexibility, beginning with a facility much smaller than the currently planned 150 GL per year plant.
- Be owned and operated by the Victorian Government so that it can be turned on and off as needed to minimise additions to electricity demand and so that it doesn't destroy incentives for water efficiency and more sustainable water supply alternatives.

CONCLUSION

Environment Victoria has demonstrated that sufficient water to meet Melbourne's immediate needs can be supplied by sustainable means, thus avoiding the need for the Victorian Government's economically and environmentally risky infrastructure projects.

This work is based on a desktop study and further investigation is needed. Environment Victoria has demonstrated that by utilising currently untapped resources such as recycled water, implementing a concerted program to upgrade the water efficiency of Melbourne's housing stock, and banning logging in our water catchments, we can meet Melbourne's growing water needs while providing adequate environmental flows in our stressed rivers.

COMPARISON OF WATER SAVINGS

		Timing and amount of water delivered (GL/yr)		
		to 2012	by 2025	by 2055
		Estimated shortfall[113] 97-145 GL/yr	Estimated shortfall	Estimated shortfall 205-300 GL/yr
Next Stage Plan	Tarago reconnection	15[114]	15	15
	Sugarloaf pipeline	75	75	75
	Desalination plant	150	150	150
TOTAL		**240 GL/yr**	**240 GL/yr**	**240 GL/yr[1]**
Environment Victoria Vision	Adding purified recycled water to storages	115	115	115
	Banning logging from catchments			50-75
	Making better use of urban stormwater		Potentially huge volumes	
	Making new buildings more water-efficient • Infill development • Greenfield development		19 18-24	57 58-72
	Making existing buildings more water-efficient	20	105	140
	Improving industrial and commercial water use efficiency		Insufficient data available to make specific estimates	
	Tarago reconnection	15	15	15
	Deliver environmental flows for Thomson and Yarra rivers	-35	-35	-35
TOTAL		**115 GL/yr**	**237-243 GL/yr**	**400-439 GL/yr**

Table 3. Summary of Environment Victoria's Vision compared with Next Stage plan

[1] Environment Victoria acknowledges that the Government's Next Stage plan also includes targets and programs for improving water use efficiency, but would argue that the excessive short-term augmentation provided by the desalination plant and pipeline will undermine efficiency measures to such an extent that their potential savings will not be fully realised.

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[1] WSAA (2008), p. 263

[2] Government estimates of average household water use range from 170 KL/year (Minister for Water, 2008) to 200-300 litres/person/day or 274 KL/year for a 3-person household (from DSE 2006, p. 40).

[3] This figure includes all water used in the residential and non-residential sector, from DSE (2006), p. 39

[4] Savewater!, http://www.savewater.com.au/how-to-save-water/in-the-home [Accessed Nov 2008]; and DSE (2006), p. 40

[5] As described in Brown, R., Keath, N. and Wong, T. (2008)

[6] WSAA (2008), p. 263

[7] WaterSmart (2006), p. 16.

[8] DSE (2007), p. 20

[9] WaterSmart (2006), p. 16

[10] DSE (2006) p. 18; Note: 300GL target includes potential interconnections to other parts of the region.

[11] DSE (2007)

[12] This table is adapted from DSE (2007) Table 2.1, p. 17 highlighting the two key areas of supply augmentation.

[13] Our Water, Our Future, www.ourwater.vic.gov.au/programs/conservation [accessed 27 August 2008]

[14] DSE (2007), p. 17

[15] Victorian Auditor-General Office (2008)

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[32] DSE (2007) p.12

[33] DSE (2007)

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[41] Hughes, R. (2006)

[42] Kuczera G. (1985)

[43] RSA (1992) Fig. 3.3 p. 21

[44] Hughes (2004)

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[46] Lindsay Hesketh, Australian Conservation Foundation, *pers. comm*. Oct 2008

[47] VicForests (2008)

[48] Lindsay Hesketh, Australian Conservation Foundation, *pers. comm.*, September 2008

[49] WaterSmart (2006) p. 12

[50] Walsh, C. J., Fletcher, T. D., & Ladson, A. R. (2005) and Walsh, C. J., Waller, K. A., Gehling, J., & Mac Nally, R. (2007)

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[52] URS Consultants (2008a)

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[54] PMSEIC, 2007

[55] URS Consultants (2008a) p. SES-8

[56] Chris Walsh, University of Melbourne, *pers. comm.* 20 August 2008

[57] CSIRO (2008) p. 10

[58] Altona Recycled Water Project, at www.hobsonsbay.vic.gov.au/Files/Appendix_8_Recycled_Water_Supply.pdf [Accessed Oct 2008]

[59] White et. al. (2006), Fig. 2. p. 31

[60] George Wilkenfeld and Associates (2006), p. 75. In contrast, URS Consultants (2008a) put the figure as low as 9 KL/year (Table 3-3)

[61] Government estimates of average household water use range from 170 KL/year (Minister for Water, 2008) to 200-300 litres/person/day or 274 KL/year for a 3-person household (from DSE 2006, p. 40). This study is therefore relying on the figure of 224 KL/yr for a 3-person household used in URS Consultants 2008b as a mid-range estimate.

[62] A system which saves and re-uses cold water running from hot taps while waiting for hot water to arrive.

[63] George Wilkenfeld and Associates (2006), p. 75

[64] URS Consultants (2008b), Table 6-4

[65] Defined as achieving a positive Net Present Value

[66] URS Consultants (2008a), Table 3-3

[67] URS Consultants (2008a) p. SES-8

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[71] Assuming 14,000 new dwellings per annum, and average household water use of 224 KL/yr (from URS Consultants (2008b), Fig. 4-4) and water savings do not begin to be achieved until at least 2010.

[72] These water savings are conservative as they are based only on housing and exclude potential water savings from applying standards to new non-residential buildings

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[75] Coombes, P and Foster, G (2008)

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[77] Assuming average household water use of 224 KL/yr (from URS Consultants (2008b), Fig. 4-4) and water savings do not begin to be achieved until at least 2010.

[78] These water savings are conservative as they are based only on housing and exclude potential water savings from applying standards to new non-residential buildings.

[79] Information sourced from Green Building Partnership, 60 Leicester St, Carlton

[80] According to Government figures, conservation programs have achieved a 34% reduction in per capital daily water use. *Our Water Our Future*, www.ourwater.vic.gov.au/programs/conservation [Accessed 27 August 2008]

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[85] Crooks, M. (2008). An alternative model is Sydney Water's Waterfix residential retrofit program which charges householders (including tenants) $22 for $180 worth of plumbing services including installation of water-efficient showerheads, flush-reducing devices for toilets and aerators for kitchen and bathroom taps, as well as repair of any minor leaks. Sydney Water estimates this service can save householders on average nearly 21,000 litres of water and $66 a year on their water bills. Sydney Water at http://www.sydneywater.com.au/SavingWater/InYourHome/WaterFix [Accessed November 2008]

[86] Testimonial from Environment Victoria members

[87] WaterSmart (2006) p. 31

[88] Savewater!, http://www.savewater.com.au/how-to-save-water/in-the-home/rainwater [Accessed Oct 2008]

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[92] This calculation is not taking into account the households which already have some measures such as water-efficient showerheads installed, but is assuming that a small percentage of homes would be taking full advantage of all savings achievable through the installation of the full package of water-saving measures.

[93] 1.46 million homes connected to water supply system, WSAA (2008), p. 264

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[95] DSE (2007) p. 18

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[110] DSE (2006), Action 4.48a, p. 102

[111] WGCMA (2007) and DSE (2006), Table 2.1, p. 22

[112] White, S. et. al. (2006)

[113] DSE (2006), p. 18

[114] The Tarago Reconnection, while not detailed in this report, is an existing Victorian Government action expected to provide 15 GL annually from 2009 (from DSE 2007, p. 16)